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WONDERS OF THE BIRD WORLD

Frontispiece. The Dance of the Cock-of-the-Rock. *P.* 125.

WONDERS

OF THE

BIRD WORLD

BY

R. BOWDLER SHARPE, LL.D., F.L.S., ETC.

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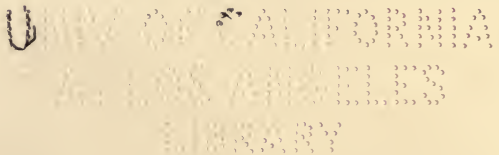
With Illustrations by A. T. Elwes



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Dedicated

TO THE MANY THOUSANDS OF
MY COUNTRYMEN
AND COUNTRYWOMEN
WHO HAVE HONOURED MY LECTURES
WITH THEIR PRESENCE,
IN MEMORY OF THE MANY
HAPPY HOURS
SPENT IN
THEIR COMPANY.

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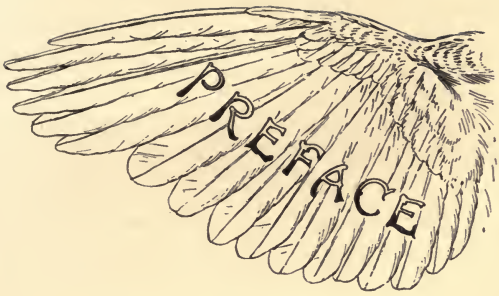

THIS little book contains the gist of my lectures on the 'Curiosities of Bird Life,' and kindred ornithological subjects, as delivered by me in many parts of the United Kingdom during the last ten years. I have often been asked to publish my lectures, and had even commenced a series of articles in 'Good Words' in 1895, under the title of my best-known lecture, 'Curiosities of Bird Life.' Since that date, however, this title has been used for another volume; but I trust that even under the new name which I have adopted for this work, many of my friends will recognize the lectures which it was the delight of my heart to give. Acting under medical advice, I may no longer undertake the strain of speaking in public, and I have, therefore, acceded to the request to publish the substance of the lectures which I was in the habit of delivering extempore. I have thus been able to give

the authority for the statements which I made in public, and I have tried to amplify the lectures, which of necessity were more or less sketchy, by giving quotations from the writings of those authors, whose experiences formed the basis of my popular discourses.

I trust that there are many of my friends who will like to have a memento of the evenings which were always a source of great pleasure to me at the time, and I hope that the lectures, now for the first time issued in book form, will not be found to have lost their interest.

R. Bowdler Sharpe.

Chiswick,
Oct. 12, 1898.

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Wonders of the Bird World

CHAPTER I

WONDERFUL BIRDS

The Gold-crest (*Regulus regulus*).

The Migration of a Gold-crest—Extinct Forms—The Archæopteryx—The Phororachus—The Secretary Bird—The Seriama—Ratite or Struthious Birds—Kiwis—Rheas—The Hoatzin.

I HAVE frequently been asked, "Which do you consider the most wonderful bird in the world?" It is a difficult question to answer, and I always shirk the reply, for in my opinion *every* bird is wonderful, and the more we study their habits, and try to understand their inmost lives, their thoughts, their instincts, the more wonderful do birds appear. I well remember a gentleman calling on me at the Natural History Museum in October 1897, bringing with him a small bird in a cage. It was a little Gold-crest (*Regulus regulus*), which had flown into the topmost car of

the Gigantic Wheel at the Earl's Court Exhibition on the preceding night, about 10 p.m. I had never studied a Gold-crest alive at such close quarters before, and I thought I had never seen such a wonderful little creature in my life. As it hopped backwards and forwards in its cage, it carried its brilliant orange crest in a manner not depicted in any drawing of the species with which I am acquainted, and, instead of displaying the crest as an ornament of the male sex, as most people imagine, the brilliant crown was overshadowed by the raised feathers on the sides of the head, and was by no means in evidence as one would have expected it to be. The Gold-crest is a common enough bird in Great Britain, and I have often seen it in a wild state, but certainly I never realized what a beautiful little creature it really was, until I had the opportunity of examining it in captivity. Then again arose the thought of the incidence of its capture—in the middle of a big city in the darkness—and the remembrance of this tiny being's migration; for, of course, it was proceeding south by night, when the fatal glare of the electric light at a great elevation lured it to its capture. And then I recalled my experience in Heligoland in 1876, where I first became acquainted with the phenomenon of bird-migration in its fullest sense, when I spent a fortnight on that sea-girt rock, and witnessed with Mr. Frank Nicholson and the late Mr. Henry Seebohm, the autumn flight of many a migrant. Heligoland is an isolated rock standing out in the Baltic Sea, off the mouth of the Elbe, and in 1876 possessed but a single tree of any size, which was growing half-way down the staircase which connects the upland with the shore. In this tree, during the daytime, settled many little weary birds after their long journey across the sea, and as we went down each day to the shooting-ground on Sandy Island, several Gold-crests would be laid out for purchase by the small boys of the island, who shot them with catapults.

Truly wonderful little travellers, if only their migration to Heligoland is considered; but we know that on the east coast of England also, the Gold-crests arrive during the autumn in vast numbers, travelling across the North Sea to our shores. Thus in every sense this little species may be considered a wonderful bird, and there are numbers of species just as wonderful in their flight and in their general economy.

In talking of extraordinary birds, however, our minds naturally revert to the past, and we are tempted to inquire as to the origin of bird-life on the earth, and as to the aspect of the forerunners of the present race of birds which we see around us to-day. In no Class of animals is the record so imperfect. Fossil mammals and reptiles have been discovered in the beds of bygone ages, which help greatly to the understanding of the present forms of these animals on the earth, as evolved from those of past times, but with birds the case is different. Probably on account of their lighter bodies, which may have been swept away by rivers or torrents, the fossil remains of birds are few, and we know very little of the species which inhabited the globe in ancient times. The fossil birds as yet discovered help us but little, for we find that where extinct Penguins, Tinamous, etc., have been discovered, it has been in the countries where both these groups flourish at the present day. The same may be said of the flightless Emeus and Rheas, though we have evidence in the case of the Ostrich that its range was once more widely extended than it is in our own era. The discovery of a large extinct species of Coot (*Fulica*) in the Chatham Islands, which finds its nearest ally in an extinct form in Mauritius, associated as it is with other fossil forms of flightless Rails (*Rallidæ*) and other birds, suggests to us the possibility of a former land connection between portions of the earth at present far distant and separated by seas of great depth.

Thus a problem of great interest is at once suggested, of which I speak more fully in a subsequent chapter on the 'Geographical Distribution of Birds.'

Figure of the *Archæopteryx*.
From a picture by W. P. Pycraft.

Certainly one of the most wonderful of birds must have been the *Archæopteryx*, an archaic type of the Jurassic age, and known only from the fossil remains of two specimens discovered in the lithographic slate of Solenhofen in Bavaria. Like several other ancient forms of bird life, the *Archæopteryx*, or Lizard-tailed bird, possessed actual teeth, and it had a very reptilian-looking head. That it was a real bird, however, is proved by the impression of the feathers which are to be seen

Head of *Archæopteryx*.

Restoration of the Tooth-billed Diver (*Hesperornis regalis*).

in the slabs of lithographic stone enclosing its remains in the British Museum and in Berlin. It will be seen from

Suggested restoration of *Phororachus inflatus*, Amegh. From a sketch by W. P. Pycraft.

the illustration which has been drawn from the restoration designed by my friend, Mr. W. P. Pycraft, and now in the

Bird Gallery at the Natural History Museum, that the *Archæopteryx* possessed a totally different kind of tail from that of any existing bird. Instead of having a fan-shaped tail like that of our ordinary birds at the present day, it had a long lizard-like tail, consisting of some twenty vertebræ, to which were attached in pairs the rectrices, or tail-feathers. It was apparently of the size of our Common Rook (*Trypanocorax frugilegus*). Another peculiarity of the *Archæopteryx* lies in the fact that the three fingers of the wing corresponding to the three fingers of existing birds, were all furnished with a large claw, just as are the fingers of reptiles. In those few birds of the present day which have claws on the wing, never more than two are found, that on the third finger being absent. In at least one instance, that of the Hoatzin, these claws have a functional value, being used by the nestling for climbing purposes.

Among the many fossil forms discovered in the Cretaceous beds, two from North America particularly deserve notice, viz. the genera *Hesperornis* and *Ichthyornis* of Professor Marsh. Both of these had actual teeth, and the first opinion of the describer was that they formed a separate and distinct Order of Birds, which he called *Odontornithes*, but recent research tends to prove that *Hesperornis* was a kind of flightless Diver, and *Ichthyornis* was probably allied to the Cormorants of our day. More wonderful birds of the Eocene period have also been discovered in Patagonia. These are called *Stereornithes*, and of one of them Mr. Pycraft has attempted a restoration, viz. of the genus *Phororachus*, based upon the remains discovered by Professor Ameghino, and now in the Natural History Museum. It was in all probability a giant form of Seriama, a bird peculiar to South America, and one which has been variously placed by ornithologists among the Hawks, or near the Bustards and Cranes. In general aspect a Seriama is not unlike the Secretary Bird (*Serpentarius secretarius*) of Africa, and in many of their

habits these curious birds resemble each other. They are both amply crested, they have long legs and a graduated

The Secretary-Bird (*Serpentarius secretarius*).

tail, and the bill is Accipitrine and Hawk-like, more so in

the Secretary Bird, which is, moreover, a thorough ground Hawk in its ways. It is an inhabitant of the more open country in Africa, and is everywhere protected on account of its supposed utility in killing snakes, and especially cobras. The latter it is said to approach with the wings spread out in front of it to act as a shield, and from under this protection it rains a shower of blows of extraordinary power with its feet, and generally ends by crushing the reptile in a very short time. Any one who has seen a Secretary Bird strike a dead rat and reduce it to a pulp in a few seconds, can bear witness to the hammer-like force with which the bird brings down its feet on its victim. And this is the more remarkable, because Mr. Layard says that the young Secretaries have such brittle legs, that they snap, if the birds are startled into a run.

Stalking through the grass, the great height of the Secretary, thanks to its long legs, enables it to take a wide view of the surrounding country and it is thus able to perceive its prey at a considerable distance. It at once elevates its crest and spreads its wings, and in the contest which ensues, the cobra will have but little chance, though on some occasions the Secretary comes off second best, and has been known to die from the poison of the snake, should the latter succeed in drawing blood. The bird is capable of swallowing snakes five or six feet in length and four inches in diameter, and it also devours rats and lizards, tortoises, as well as locusts and other insects.

The South American Seriama (*Cariama cristata*) is a much smaller bird, and is an inhabitant of the open Campos of south-eastern Brazil and Argentina. An allied species, Burmeister's Seriama (*Chunga burmeisteri*), is found in the province of Tucuman. Both forms of Seriama are ground birds, and the common species inhabits the grassy country, while the *Chunga* lives in the forest. They have a harsh and screaming cry, and feed on insects

and berries, as well as snakes and other reptiles. They have the same peculiar habit as the Secretary of pounding

The Seriama (*Cariama cristata*).

their prey to a pulp by striking it with their feet. The nest is placed in a low bush, and the two eggs are some-

what like those of the Rails (*Rallidæ*), being rather rounded and spotted. Their method of nesting is also different from that of the Cranes and Bustards, but it does to some extent resemble that of the Secretary, which builds a huge nest in a bush or a tree, and also lays but two eggs, which are white, slightly smudged with rust-colour. The Seriama must in fact be considered as a survival of some ancient form of bird life, of which probably *Phororachus* and the other *Stereornithes* were the forerunners.

Of the Struthious or Ratite Birds[1] there are four distinct stocks existing at the present day, viz. the Ostriches (*Struthionidæ*) in Africa, and Rheas (*Rheidæ*) in South America; the Emeus (*Dromæidæ*) and the Cassowaries (*Casuariidæ*) in the Australian Region; and the Kiwis (*Apterygidæ*) in New Zealand. In the latter country also lived within historic times the gigantic Moas (*Dinornithidæ*), which had close allies in the great Struthious birds of Madagascar (*Æpyornis* and *Mullerornis*). Of the Moas there were many species and several genera, varying much in size, from the great *Dinornis maximus*, which stood twelve feet high, to the smaller forms, such as *Anomalopteryx parva*, which were not more than three feet in height. Some of the lesser Moas possessed a hallux or hind toe, and thus they resembled their smaller New Zealand cousins, the Kiwis, and differed from the Ostriches, Emeus, and Rheas.

The cause of the extinction of the Moas in New Zealand has, as yet, not received any satisfactory explanation. One of the most recent discoveries of remains took place on an exposed piece of rising ground, where a man, while ploughing, happened to unearth a large bone, which he sent to Dr. H. O. Forbes, who was then the Director of the Christchurch Museum at Canterbury, New Zealand. On proceeding to the place Dr. Forbes ascertained by

[1] So called from the absence of a keel to the sternum or breast-bone, which thus resembles a raft or flat-bottomed boat (*ratis*).

probing the ground with an iron rod that the bones were not scattered over the whole area, but were confined to a comparatively small and narrow space, not exceeding thirty yards in length. Yet, on digging down to this queer sepulchre, remains of no less than six hundred Moas of all sizes were discovered, as well as those of Geese, Ducks, Birds of Prey, and other birds: so that, even if some unforeseen catastrophe had overwhelmed this herd of flightless Moas, the presence of birds of such strong flight as Ducks and Hawks is still unaccounted for. It seems certain that the Moas survived until comparatively recent times, as remains of the skin of the feet and actual feathers of the birds have been discovered. Although of such size and massiveness that some of them out-topped our Ostriches in height, the wings were certainly vestigial,[1] even if they were developed at all.

The *Ratitæ* which survive at the present day are all birds of considerable size, some of them, like the Ostriches, being gigantic. The latter birds are easily separated from the other forms by their having only two toes, nor have they any "after-shaft" to the body-feathers. This "after-shaft," as it is called, has the appearance of a duplicate of the main feather, and springs from the inner surface of the base of the same quill. In most birds it is very small, and is often absent altogether, but in some of the Ratite birds it is strongly developed and acquires the same length as the shaft of the main feather. This is the case in the Emeus, Cassowaries, and Moas, which thus appear to be clothed with double feathers. The Emeus (*Dromæidæ*) are entirely Australian, and are inhabitants of the open country, from many parts of which they have now been exterminated. They have no visible wings and tail, both

[1] The wings in the Ratite Birds are often spoken of as "rudimentary," but as they are really the *remains* of what were once well-developed organs, I prefer to speak of them as "vestigial."

of which are vestigial, and are hidden below the dense body-feathering. The Cassowaries (*Casuariidæ*) have the same long "after-shaft" as the Emeus, but they show a remarkable development of the wing; this consists of a few strong black shafts, resembling horny spines, which have no barbs like ordinary quills, but project beyond the feathers of the sides of the body, and form a visible remnant of a once functional wing. All the Cassowaries are more or less brightly coloured on the bare portions of the head and neck, and are generally ornamented with wattles, while on the top of the head there is usually a large horny casque. The inner toe also is furnished with a remarkable long straight claw. The Cassowaries are found in New Guinea and the adjacent islands, as well as in the Cape York Peninsula of Australia.

The Rheas (*Rheidæ*) are exclusively South American in their habitat; they resemble the Ostriches of Africa in their general appearance, and in the want of an "after-shaft" to the body-feathers, but they have three toes like the other *Ratitæ*.

It may lastly be mentioned that in Madagascar there have been found enormous eggs of a Ratite bird, generally in the lap of the skeleton of some chief, presumably to afford him sustenance during his passage to the other world. These eggs have since been identified as belonging to gigantic Moa-like birds (*Æpyornithidæ*) which inhabited Madagascar within historic times, and of which the sub-fossil remains of several species have been discovered. The eggs are the largest of any known bird, living or extinct.

The Kiwis differ much from the other Ratite Birds, having, like the Emeus, perfectly vestigial wings and no visible tail, but they possess a hallux or hind toe. Their plumage is of a hairy texture, and with their long curved bill, in which the nasal opening is situated near the tip instead of near the base, they have the appearance of gigantic

and clumsy-footed Rails. In my opinion they are nothing but Struthious Rails, and they very much resemble the latter birds in their nocturnal and retiring habits, and in their method of progression over the ground. Like other Struthious birds, however, they are great adepts at kicking, and in the series of living Kiwis exhibited by the Hon. Walter Rothschild at a meeting of the British Ornithologists' Club, it was amusing to see that some of

Kiwi (*Apteryx australis*).

the species kicked forwards and some backwards, but all delivered the stroke with right good will and like a flash of lightning. A formidable wound could be made by their strong feet, armed, as the toes are, with sharp and massive claws.

In habits the Kiwis are strictly nocturnal birds, and greatly resent being disturbed in the daytime. Their principal food consists of worms, for which they probe into the

soft ground, and in search of which they are probably aided by a keen sense of touch and smell, in which the peculiar position of the nostrils doubtless plays a part. Another remarkable feature in the Apteryx is the large size of the white eggs which it lays, in this respect resembling the *Æpyornithidæ* of Madagascar.

One characteristic of the Ratite Birds must also be mentioned, and that is, that the incubation of the eggs is undertaken by the male bird. As will be seen later on, there are a few other species in which this is the rule, but in these instances there may be some reason in the shape of protective colouration, but in the *Ratitæ* there is no such apparent cause, as the sexes are alike in colour. Nevertheless it is a well-known feature in all the Ratite birds, which is also shared by the Struthious Partridges (*Tinamiformes*) of South America, known as Tinamous. It is, however, curious to read of the habits of the Rhea, when the cock bird, as the nesting-season approaches, begins to utter its booming love-notes, and drives away all the younger males from the flock, or fights desperately for the harem with any male of its own age and weight. Mr. W. H. Hudson has described these fights, which are carried on in a novel way, viz. by the two combatants twisting their long necks together and then biting viciously at each other's heads, while they turn round and round, and pound the earth into a circular trench with their great feet. The females lay their eggs in a common nest, and should they not have done their laying before the cock "becomes broody," he drives them away with great fury, and begins to incubate. When the young are hatched, he takes the greatest care of them, and it is then dangerous, says Mr. Hudson, to approach the Rhea on horseback, as the bird, with neck stretched out horizontally and outspread wings, charges suddenly, making so huge and grotesque a figure that the tamest horse becomes ungovernable with terror.

The Common Rhea (*Rhea americana*), with the male bird attending to the nestlings.

Another very wonderful bird is the Hoatzin (*Opisthocomus hoazin*) of South America. It seems to be a survival on the earth of some ancient form, for it possesses features quite different from those of the birds of the present day, and it is also probably the surviving representative of a type once widely distributed over the earth, as Professor Milne-Edwards informs me that the bones of his genus *Filholornis*, from the phosphate deposits of Chaux in the south of France, can only be compared with those of *Opisthocomus*, and hence it would seem that Hoatzins of some kind or another formerly lived in Europe.

In appearance the Hoatzin is like a Game-bird, and it was for many years considered to belong to the family of Curassows (*Cracidæ*), which inhabit the South American continent. Its anatomy, however, has recently been more closely studied, and shows that it possesses characters quite different from those of the *Galliformes*, and hence the genus *Opisthocomus* is now generally allowed to constitute a distinct Family, if not indeed a distinct Order, of Birds. In the Ratite Birds we have seen that one of the most striking features in their skeleton was the complete absence of any keel to the sternum or breast-bone, and in *Opisthocomus* we find another development of this keel, differing from that of other birds. The keel is in fact only found on the posterior part of the sternum, and falls away gradually on the anterior portion of the latter, while the other bones belonging to this part of the skeleton, the coracoids and the "merry-thought" or furcula, are fused together in a manner unlike that of any other known bird. The reason for this peculiar arrangement is now recognized as a provision for the enormous crop with which the Hoatzin is provided.

The single species of the genus *Opisthocomus* is an inhabitant of the rivers of Amazonia and the northern portion of South America from Guiana to Ecuador and

Peru. Here it lives entirely by the side of the water, being apparently nowhere a rare bird in these South American countries, though, owing to the disagreeable smell which emanates from it, it is known in some places as the "Stink Bird" and is nowhere captured as an article of food. It builds a nest of sticks on the thin branches overhanging the water, and the eggs are not white as in the case of the Curassows, but are of a creamy-buff colour with dark

Embryo of Hoatzin. After Pycraft.

spots, and closely resemble those of the *Rallidæ* or Family of Rails. The bird has also other Ralline properties, for it is also able to swim well, while the young, if forced to take to the water, both dive and swim as to the manner born.

The Hoatzin is often spoken of as a "reptilian" bird, as it exhibits certain characters which are certainly reptilian. Even the unfledged embryo shows claws on the pollex and index digits of the wing, but these are much more strongly developed in the full-grown nestling, which is covered with

The Hoatzin (*Opisthocomus hoazin*).

brown down. These little people use the claws on their wings as if they were hands, and when disturbed they crawl out of the nest on "all fours," as Mr. Quelch tells us, and not only try to escape by clinging on to every little twig which offers itself, pulling themselves out of danger by the use of bill, feet, and wings, but, if upset in the water, they will swim and dive with great rapidity into the thick bushy growth on the sides of the rivers, into which they cannot be pursued.

Nestling of Hoatzin. From a specimen obtained by Mr. J. J. Quelch, exhibited in the Bird Gallery of the Natural History Museum.

CHAPTER II

WONDERFUL BIRDS (*continued*)

Frigate Bird.

The Megapodes or Mound-builders—The Whale-headed Stork—The Dodo and its kindred—Darters—Frigate Birds—Steamer-Ducks—Penguins.

To the Australian Region we turn for our next wonderful bird and find it in the Brush Turkey (*Catheturus lathami*). This bird belongs to the family of Megapodes or Mound-builders (*Megapodidæ*), the species of which are found only in the Australian and Malayan sub-regions, extending as far as the Philippines, and the Nicobar Islands in the Bay of Bengal. None of the true Megapodes make any nest, but place their eggs in a mound and leave them to be hatched by the fermentation of the latter or by the heat of the sun. They differ from all other Game-birds except the Curassows in having the hind toe on the same level as the other

toes, whereas in ordinary Game-birds the contrary is the case, and the hind toe is elevated above the level of the others.

The name of Brush Turkey has been bestowed upon the members of the genus *Catheturus* and its allies on account of the coloured wattles of the neck, which resemble those of an ordinary Turkey (*Meleagris*). The size of the mound which the Megapodes raise is sometimes enormous, and is generally the work of several birds. Both sexes are believed to assist in the work of construction, which is achieved by means of their powerful feet; these are apparently the most strongly developed "scratching" organs to be met with in the whole Class of Birds. The mounds are used, and added to, year after year. Many of them are of great size, and sometimes reach a height of five or six yards, with a circumference of thirty yards or more, and the labour in constructing them must be considerable, seeing that the birds use but one foot when piling up the earth and refuse of which the mound is composed. Gould says that he has seen the Brush Turkey seize the material of which it was making the mound in its foot, and throw it back to one common centre, the surface of the ground being so completely scratched over that scarcely a leaf or a blade of grass was left; and a nestling Megapode which was kept in confinement has also been seen to scratch up and grasp a handful of sand, using one foot only, so that from the earliest age the mound-building instinct is evidently inherent in the bird. Another singular feature in the economy of the Megapode is that the nestlings, when they escape from the egg, are fully clothed with feathers and provided with perfectly formed wings, so that they can fly at once. At the same time it appears certain that they do not always avail themselves of their privilege, unique among birds, for nestlings have been dug out of mounds at a great depth. Some of the little birds are believed to have

been quite three weeks old, so that it is difficult to imagine the object of their stay in the darkness when they were quite able to support themselves outside; and, again, one is tempted to inquire how they can see, and on what they feed during their imprisonment in the mound. In some places the natives suggest that the old females do not absolutely desert their young, but that, on the contrary, both parents revisit the mound and uncover the eggs. The latter are sometimes placed at an extraordinary depth in the mound. Thus Gilbert relates that he saw eggs of the Australian Megapode (*Megapodius tumulus*) dug out by natives from a depth of six feet. Only one egg is laid by the female in a hole in the mound, and the earth is then strewn very lightly and the hole covered up. Several eggs are found in the same mound, but each in its separate hole, and with the broad end uppermost. In many of the islands a trade is done by the natives, who sell the eggs to passing ships, and the birds are therefore generally preserved with care, and even become semi-domesticated. Speaking of Brenchley's Megapode (*M. brenchleyi*) in the Solomon Islands, Mr. C. M. Woodford says that when he landed on Savo he saw "hundreds of Megapodes" scratching out their holes in the warm sand, and scarcely stopping at his approach. He writes—

"The natives highly prize its eggs as an article of food. They are considerably larger than a duck's egg, and out of all proportion to the size of the bird. The birds lay in open sandy clearings, generally near the sea, which are kept clear of shrubs and undergrowth by the natives, and by the sand being constantly turned over by the birds. The eggs are buried sometimes as deeply as two feet from the surface, and are hatched by the natural heat of the hot sand. Many thousands of birds congregate at the same place, the laying-yards being often some acres in extent. At the island of Savo, where these birds especially abound, they become so

The Brush Turkey (*Catheturus lathami*).

tame that I have seen a native digging out eggs, and birds digging fresh holes to lay in within a few yards of one another. Dogs do great damage by destroying the eggs and birds. The natives consequently spear all the dogs caught trespassing in the laying-yards. Another enemy to the eggs is the large Monitor Lizard (*Varanus indicus*); in many of the yards the marks left by their tails, like that made by a stick drawn along the sand, may always be noticed."

The Mound-builders are, as a rule, birds of very dull and sober brown plumage, and beyond a little bright colour on the heads and necks they show but slight ornamentation in colour. An exception may be made in the case of Wallace's Megapode (*Eulipoa wallaci*), which is rather prettily banded, and the Moleo-bird of Celebes (*Megacephalum maleo*) rejoices in a lead-coloured knob on the head and in a delicately-tinted pink breast. The Moleo is supposed to lay about eight eggs in the season, and therefore Dr. Wallace believes that three months must elapse between the laying of the first and the last egg. The latter is large for the size of the bird, and it is suggested by the above-named author that as the egg fills up the lower cavity of the body, and the remaining eight or ten eggs are only of the size of small peas, the long period which elapses between the laying of each egg and the placing of them in a mound, is a wise provision of Nature, as the birds could not hatch them out in the ordinary way, while they would certainly starve if their nidification lasted over three months. One great difference between the method of hatching the eggs by the Moleo as compared with that of the other Megapodes, seems to be that it never constructs a big mound like the generality of these birds, but, on the contrary, digs a pit in the sand to a depth of one to three feet, and therein deposits its egg. It is also particular as to the kind of sand it adopts for the hatching of the egg, and Dr. Meyer says that in

Wallace Bay, in Celebes, the bird chooses the black volcanic deposits in preference to the white sand.

Although the habits of the Mound-builders have deservedly attracted the attention of naturalists as one of the most remarkable phenomena of nature, there has never been a more intelligent account written than that of Dr. Meyer and Mr. Wiglesworth in their lately published 'Birds of Celebes' (vol. ii. p. 681), and as it contains a number of new and hitherto unpublished conclusions, I make no apology for quoting it in full. The authors write of the Moleo—

"Unlike the *Megapodius*, the Megacephalon does not raise a heap of rubbish in which to lay its eggs, but sinks a pit in the sand which it afterwards fills in, burying its egg to a depth of from one to three feet. One of its favourite breeding-grounds has been made known by Dr. Wallace in a spot on the north coast between the islands of Lembeh and Banka, to which Dr. Guillemard and his companions have given the name of 'Wallace Bay.' Meyer has described it as a large irregular bay, with *black* sand, which did not consist of sand in the common term, but of small stones up to the size of a bean, into which the foot sank up to the ankle. It seems to mark, as Wallace first observed, an ancient lava stream of the Klaba Volcano, which has flown down a valley into the sea, and become decomposed and triturated into loose black sand.

"In the Bone Valley, Von Rosenberg noticed that the eggs stand on end upright in the sand in which they are laid. According to Wallace, a number of females lay in the same hole, each egg being that of a different bird; but whether he makes this statement from personal observation, or after the assertions of the natives (which are utterly unreliable), or from the finding of many fresh eggs[1] in the same hole, we are not told. Like Dr. Guillemard, Dr.

[1] Many days appear to elapse between the deposit of the successive eggs.

Wallace watched the birds at work in pairs, choosing either a fresh place or an old hole, but it appears still to need confirmation, whether other pairs make use of the same hole. Owing to the continuous diggings the surface of the sand must always be changing in appearance. Guillemard compares it 'to nothing better than the surface of a rough, confused sea'—and it is conceivable that it would be impossible for a female to discover the spot where it laid its first egg.

"Although the Moleo is not known to take any further care for the egg or its product, after the former has been laid in an upright position and covered deeply with sand, this apparent lack of philoprogenitive affection so strongly developed in most birds is counterbalanced by the extraordinary forethought—if one may use the word—for the ultimate welfare of the young displayed by the parent-birds, in selecting the places where their eggs and offspring will be left to their fate. The burying of the egg at a considerable depth answers two purposes, protection from egg-eating animals [N.B.—The eggs do not, however, always escape. Dr. Meyer shot a young crocodile (*Crocodilus biporcatus*), three feet in length, busy digging for eggs in a Moleo-hole, and saw other crocodile-diggings], and the preservation for it by the needful heat of the sun absorbed during the day, by which the eggs are kept from perishing in the cool of the night. Now black absorbs heat, while white reflects it, and this seems to be the reason why the birds have made a chief breeding-spot of the hot black volcanic sand of Wallace Bay. It is interesting to note that the black gravel on these shores alternates with white sand, as Dr. Meyer knows from personal observations, and that the Moleos only select the black sand, as far as is known. A similar observation is made by Dr. Studer on *Megapodius freycineti* in New Britain. Here the bird lays its eggs in black volcanic sand, the temperature of which

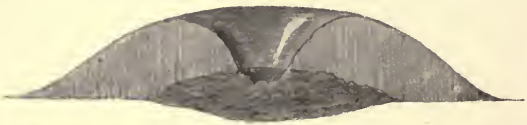
registered 38° to 40° C. and cooled but little during the night, 'as the black sand absorbs very much heat and emits little' ('Reise der Gazelle,' iii. p. 253, 1889). But a much more striking display of sagacity in the selection of breeding-spots by the Moleo is recorded by the cousins, Drs. P. and F. Sarazin, whose account we translate. In the Bone Valley (about 750 feet) the naturalists came across 'a great number of pits, which Moleo-fowls had dug out in order to lay their eggs there. Our people made a search, and we secured, to our satisfaction, four new-laid eggs. In the same bamboo-thicket, exactly on the spot where the numerous Moleo-pits were scraped out, one against the other, like wolf-pits, was a warm spring. The temperature of the water must have been about 60° C. The circumstance that, here in the mountains, where the temperature, especially in the forest, is on the whole low, Moleo eggs laid simply in the earth should come to full development, had puzzled us here already, and led us to suspect a connection between these diggings and the warm spring. Somewhat further on our journey up to Bone Valley (about 1500 feet), we came upon Moleo-diggings again, and, as in the last case, we discovered not far from them a warm spring of perhaps 50° C., which formed a little brook. Although on putting our hands into it, a sharp smarting sensation of the skin between the fingers resulted, all the stones of the brook were coated with blue-green algæ. With regard to the breeding of the Moleos, therefore, we are able to maintain our opinion that the bird indeed lays its eggs in the sand on the hot seashore, where the heat of the sun then proves powerful enough to hatch them, but that in the mountains, and especially in the shady forest of the interior, for the warmth of the sun must be substituted some other power, and for this purpose the Moleo chooses the vicinity of warm-water springs, which it searches out, and makes its breeding-pits in the ground warmed by the hot springs. Accord-

ingly, where Moleos are encountered in the interior of Celebes, there warm springs will be found not far off. The Moleo thus makes use of the two inorganic sources of warmth by which its eggs are to be hatched, viz., on the one hand the sun, on the other warm springs, though other Megapodes make use of the heat produced by the fermentation of vegetable matter placed over their eggs. Of the influence of the warm springs we found further confirmation, for near another still hotter spring, in which one could not keep one's hand, and which had formed a considerable pool, Moleo-pits were again found. We had them dug out, and procured two eggs for our rapidly-diminishing larder. Finally, we came across a third spring, and observed Moleo-pits near it also.' Later on the Sarazins found similar Moleo-pits also on the Lokon Volcano, in ground strongly heated by hot steam."

The above extract may be rather long, but I hope that my readers will peruse it carefully, for it is one of the most suggestive narratives of the 'Wonders of the Bird World' with which I am acquainted, and is quite new to English students of natural history. When Gould made his celebrated journey to Australia to study the life of the native animals of that wonderful continent, he considered his discovery of the nesting-habits of the Mound-builders as one of his greatest achievements, and since his day many facts have come to light respecting the habits of these truly extraordinary birds.

Our final note on the Megapodes must be devoted to the life of the nestlings. Writing of the *Lipoa* or Ocellated Megapode of Australia, the late Sir George Grey sent the following note to Mr. Gould from "Government House, Adelaide, December 14, 1842"—"There is only one male and one female *Lipoa* to each mound. They repair the old mound and do not build a new one, both birds assisting in scratching the sand to the nest. The female commences to

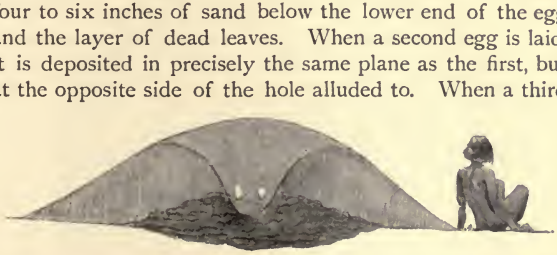
lay in the early days of September, or when the spear-grass begins to shoot. Both sexes approach the nest together when the female is about to lay, and they take an equal share in the labour of covering and uncovering the mound. After every sunrise the female deposits an egg, and lays altogether from eight to ten. If the natives rob the mound, the female will lay again in the same nest, but she will only lay the full number of eggs twice in one summer. From the commencement of building, until the last eggs are hatched, four moons elapse, which would give a very long period of time before the last young one emerges. The nestling scratches its way out alone, and the mother does not assist it. The young birds usually come out one at a time; occasionally



Section through the mound in its undisturbed state, the pale tint indicating the portion of sand, the darker tint the leaves, etc. (From a sketch by the late Sir George Grey in Gould's 'Handbook.')

a pair appear together. The mother, who is feeding in the scrub in the vicinity, hears the call of the nestling and runs to it, and then takes care of it as a domestic fowl does of its chick. When the young are all hatched, the mother is accompanied by eight or ten nestlings, who remain with her until they are more than half-grown. The male bird does not accompany them." The mound of the *Lipoa* is described by Sir George Grey as follows—"A nearly circular hole, of about eighteen inches in diameter, is scratched in the ground to the depth of seven or eight inches, and filled with dead leaves, dead grass, and similar materials; and a large mass of the same substance is placed all round it upon the ground. Over this first layer a large mound of sand, mixed with dried grass, etc., is

thrown, and finally the whole assumes the form of a dome. When an egg is to be deposited, the top is laid open, and a hole is scratched in its centre to within two or three inches of the bottom of the layer of dead leaves. The egg is placed just at the edge of the hole, in a vertical position with the smaller end downwards. The sand is then thrown in again, and the mound is restored to its original form. The egg which has thus been deposited is, therefore, completely surrounded and enveloped in soft sand, having from four to six inches of sand below the lower end of the egg and the layer of dead leaves. When a second egg is laid, it is deposited in precisely the same plane as the first, but at the opposite side of the hole alluded to. When a third



Mound of *Lipoa ocellata*. From a sketch by the late Sir George Grey. The light part represents the sand, the darker tint that which is made of leaves, etc. (From Gould's 'Handbook to the Birds of Australia.')

egg is laid, it is placed in the same plane as the others, but, as it were, at the third corner of the square. When the fourth egg is laid, it is still placed in the same plane, but in the fourth corner of the square, or rather of the lozenge, the figure being of this form

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The next four eggs in succession are placed in the interstices, but always in the same plane, so that at last there is a circle of eight eggs all standing upright in the sand, with several inches of sand intervening between each."

With regard to the extraordinary habit of the newly-hatched young remaining in the mound for some time after it has emerged from the egg, Sir George Grey relates that

in the nests he found the white ants to be very numerous, "thus showing a beautiful provision of nature in preparing the necessary tender food for the young bird in its emergence." A specimen of a nestling of Cuming's Megapode (*Megapodius cumingi*), not only fully fledged, but having perfect wings, and thus able to take care of itself

A bird's-eye view of the mound of *Lipoa* as seen from above. The sand is supposed to have been so far thrown out as to leave the tops of the eggs exposed, and to show them standing upright in their relative positions. (From a sketch by the late Sir George Grey in Gould's 'Handbook,' ii. 162.)

in every way, was dug out of a mound in the island of Palawan by Mr. John Whitehead, and one may well ponder over the circumstances which induce the baby Megapodes to remain in the darkness of their mound for many days, perhaps weeks. What do they feed on, and why, having perfect wings to fly with, and strong legs to run with, do they not come out at once from the darkness and roam

about in the jungle like their parents? The difference between the appearance of an ordinary Chicken and that of a young Megapode depends upon the fully developed wings of the latter, and the absence of flight-feathers in the former. Writing of Cuming's Megapode,

Nestling Megapode, to show the fully-developed wings.

Mr. Whitehead observes—"The young bird's early life is to me a mystery. It may be dug out of the heap fully fledged and ready to fly. I got one which might well pass for the adult bird of another species, but this nestling had never seen the daylight till we dug it out: none of the feathers had soft shafts, or seemed in any way new. The

young are neither fed nor looked after by their parents, which, as they are of all ages, would be difficult. They generally squat until you are within fifteen yards or so, and then take wing like a Quail, never running out of danger like the old birds."

There are many forms of birds which have a perfectly grotesque appearance. Such are some of the Storks and Herons, and there is no more comical-looking creature than an Adjutant or Marabou Stork, examples of which are nearly always on view in our Zoological Gardens. They are ungainly creatures to look at, having a bare and scabby head, while from the fore-neck depends a pouch which the bird is able to inflate, and repulsive as this hanging sack looks on the neck, it is apparently intended as a sexual ornament. Not only do the bare head and neck, and the ruff of white feathers round the latter, give a vulturine appearance to the Adjutant, but the large Indian species (*Leptoptilus dubius*) is a Vulture in many of its habits, and associates with the latter birds as a scavenger, devouring carcases of dead animals and all kinds of offal. So useful are the birds in this respect, that in many parts of India the Adjutant is protected by law. They also soar high in the air like their vulturine allies, and although the only noise that they make in confinement is the snapping of their bills after the manner of other Storks, they are said to make a grunting noise like the lowing of a buffalo during the breeding season. At the latter time they resort to trees and build a large nest, often in company with Pelicans, though they sometimes make their nests on the bare rocks at a considerable height in the mountains.

Another grotesque-looking creature is the Shoe-bill or Whale-headed Stork (*Balæniceps rex*), which lives in the districts of the Upper Nile. Since the Soudan has been so disturbed, no specimens of animals have been sent from there for several years, and it is a long time since a Shoe-

bill has been seen in Europe. The range of this peculiar bird must be very limited, as it has not been procured in any other of the marshy districts of Africa.

The first mention of this extraordinary bird occurs in the writing of the German traveller Werner, who visited the White Nile districts in 1840-41, when he states that he saw a bird on the so-called No Lake, which was "as large as a young camel, with a bill like a Pelican, but without the pouch." Eight years later an Italian slave-dealer, named Nicola Ulivi, brought two skins to Khartoum, which were ultimately bought by an English traveller, Mr. Mansfield Parkyns, in Cairo, and sent to London, where they were described and figured by Gould in 1851. The English Consul Petherick had several living examples at Khartoum, and in 1860 he managed to bring two of them alive to England, where they lived for some time in the Zoological Gardens. He observes—"The *Balæniceps*, though found only in or near water, is but rarely seen on the banks of the Nile, and then only during a short period of the year, when the interior is dried up, in the summer, during the short hot season preceding the rains. It prefers the natural banks and morasses of the interior, where the shallowness of the water, distributed over a large surface, affords it greater facilities for wading than the banks of the Nile. These frequently shelve off into deep water more or less abruptly, and thus furnish but comparatively few spots favourable to the support and habits of the bird.

"For this reason, at about 100 miles west of the Nile, in from 5° to 8° N. Lat., at Gaba Shambyl, where I have a station of elephant-hunters, these interesting birds exist in greater numbers than on the Nile or the comparatively deeper waters of the Bahr-el-Gazal. At Gaba Shambyl, striking off directly west from the Nile, the country for the first thirty miles rises with an almost imperceptible slope, when it again decreases in elevation for a distance of from

sixty to seventy miles. Here it becomes a large morass, with occasional dry spots, which form so many islands after the annual rains, in a sheet of water that from north to south extends probably over one hundred and fifty miles, having no outlet directly to the Nile, but, when the water is at a certain height, overflowing into a channel connecting it with the Bahr-el-Gazal. This reservoir, which is more or less supplied with water all the year round, abounds in reeds and thick brush, and is the favourite retreat and home of the *Balæniceps*. The birds are here seen in clusters of from a pair to perhaps one hundred together, mostly in water, and when disturbed they fly low over the surface of the latter, and settle at no great distance; but, if frightened and fired at, they rise in flocks high in the air, and after hovering and wheeling around, will settle on the highest trees, and as long as their disturbers are near, will not return to the water. Their roosting-place at night is, to the best of my belief, on the ground. Their food consists principally of fish and water-snakes, which they have been seen by men to catch and devour. They will also feed on the intestines of the dead animals, the carcases of which they easily rip open with the strong hook of the upper mandible.

"The breeding time of the *Balæniceps* is in the rainy season during the months of July and August, and the spot chosen is in the reeds or high grass immediately on the water's-edge, or on some small elevated and dry spots entirely surrounded by water. The birds, before laying, scrape a hole in the earth in which, without any lining of grass or feathers, the female deposits her eggs. As many as a dozen eggs have been found in the same nest. Numbers of these nests have been robbed by men of both eggs and young, but the young birds so taken have invariably died. After repeated unsuccessful attempts to rear them, and more trouble than one can imagine, after two years'

The Whale-headed Stork (*Balæniceps rex*).

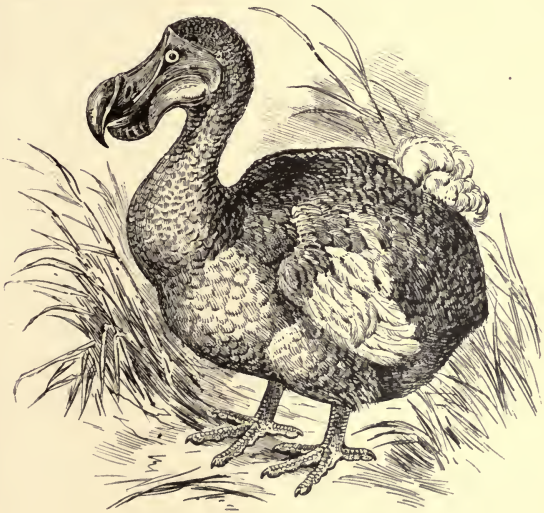
perseverance I at last succeeded in hatching some eggs under hens, which, at a considerable distance from Gala Shambyl, I procured from the Raik Negroes. As soon as I got the hens to lay and in due time to sit, by replacing several of their eggs with half the number of those of the *Balæniceps*, as fresh as possible from the nest, the locality of which was previously known, I eventually succeeded in hatching several birds. These ran about the premises of my camp, and, to the discomfort of the poor hens, would persist in performing all sorts of unchicken-like manœuvres with their large beaks and wings in a small artificial pool, constantly supplied with water by several negresses retained in my service for their especial benefit. Negro boys of the tribe (the Raik) were also employed to supply their little pond with live fish, upon which, and occasionally on the intestines of animals killed for our use and chopped into small pieces, they were reared. As may be supposed, the birds became the pets of my 'Bizouks,' as I frequently called my Khartoumers; and as they grew up, with extended wings and a rattle-like noise produced by the snapping of their bills, they would follow them round the large enclosure of my camp. The eggs are white, or bluish-white with a chalky covering, and on being held up to the light, the lining is seen to be of a dark green."

I cannot conclude this chapter on wonderful birds without a reference to our old friend the Dodo (*Didus ineptus*). This quaint creature lived on the island of Mauritius, where it was plentiful a little more than three hundred years ago. Its unwieldy size and feebly developed wings deprived the poor Dodo of any chance of survival on the earth, as it was not able to fly and so escape from its enemies; and the survivors of this interesting and anomalous form of bird-life were annihilated by the sailors who visited the island and brought cats and pigs with them, which

must have hastened the process of extermination. The Dodo was a gigantic, flightless, antique Pigeon, and appears to have been confined to the island of Mauritius, where a considerable number of its osteological remains have been unearthed during the past forty years, so that more than one nearly complete skeleton is to be found in Museums in this country. Several drawings and paintings of the bird are also preserved in various Institutions in Europe, but the actual remains of the bird itself are very few, and no perfect specimen of a stuffed Dodo is in any collection to-day, though in the Oxford Museum is a head and right foot, and the British Museum possesses a left foot. Another head of the Dodo is in the Copenhagen Museum. Many of the pictures representing the bird must have been drawn from life, for it is certain that more than one specimen reached Europe alive. The sketch of the bird in the present volume is drawn from the oil-painting in the British Museum, which is believed to have been the work of Roelandt Savery, who died in 1639, and who painted several pictures of the Dodo, apparently from living birds.

In the neighbouring islands of Réunion and Rodriguez also lived two Didine birds. Of that which inhabited the former island nothing remains but tradition, and no specimens of any kind are known. Of the "Solitaire" (*Pezophaps solitarius*) of Rodriguez, many osteological remains have been discovered in the caves of that island, and we also know something of its habits from the writings of the old Huguenot, Leguat, who landed on Rodriguez with other refugees in 1691, and lived there for two years. Although discredited and considered fabulous by many recent writers, the description by Leguat of the Solitaire has been strongly confirmed by the bones discovered by Sir Edward Newton and other naturalists who have made explorations in the island. The males are said to have fought for the females with great pugnacity, and they possessed a weapon of

some power in the "little round mass" of bone on the wing, which Leguat describes as being as "big as a musket-ball." These knobs have been found among the remains of the birds, and Professor Newton says that the "number of bones that had been broken and united during life contained in the collections brought to this country is very consider-



The Dodo (*Didus ineptus*).

able, showing the effects of the cestus-like armature of the wing."[1]

The following is Leguat's account of the bird and its ways.[2]

[1] 'Dictionary of Birds,' p. 891.

[2] 'A New Voyage to the East Indies,' by Francis Leguat and his companions. 8vo. London, 1708.

"Of all the Birds in the Island, the most remarkable is that which goes by the Name of the 'Solitary,' because 'tis very seldom seen in Company. There are abundance of them. The Feathers of the Males are of a brown-grey Colour; the feet and beak are like a Turkey's but a little more crooked. They have scarce any Tail, but their Hind-part cover'd with Feathers is Roundish, like the Crupper of a Horse; they are taller than Turkeys. Their neck is straight, and a little longer in proportion than a Turkey's when it lifts up its Head. Its Eye is black and lively, and its Head without Comb or Cop. They never fly, their wings are too little to support the weight of their Bodies; they serve only to beat themselves, and flutter when they call one another. They will whirl about for twenty or thirty times together on the same side, during the space of four or five Minutes; The Motions of their Wings makes then a noise very like that of a Rattle; and one may hear it two hundred Paces off. The Bone of their Wings grows greater towards the Extremity, and forms a little round Mass under the Feathers, as big as a Musket Ball; That and its Beak are the chief Defence of this Bird. 'Tis very hard to catch it in the Woods, but easy in open Places, because we run faster than they, and sometimes we approach them without much Trouble. From March to September they are extremely fat, and tast admirably well, especially while they are young; some of the Males weigh forty-five Pound.

"The Females are wonderfully beautiful, some fair, some brown; I call them fair because they are of the colour of fair Hair; They have a sort of Peak like a Widow's, upon their Breasts, which is of a dun Colour. No one Feather is stragling from the other all over their Bodies, they being very careful to adjust themselves, and make them all even with their Beaks. The Feathers on their Thighs are round like shells at the end, and being there very thick, have an agreeable effect: They have two Risings on their 'Craws,'

and the Feathers are whiter there than the rest, which livelily Represents the fine Neck of a Beautiful Woman. They walk with so much Stateliness and good Grace, that one cannot help admiring and loving them; by which means their fine Mein often saves their lives.

"Tho' these Birds will sometimes very familiarly come up near enough to one, when we do not run after them, yet they will never grow Tame. As soon as they are caught they shed Tears without Crying, and refuse all manner of Sustenance till they die.

"We find in the Gizards of both Male and Female a brown stone, of the bigness of a Hen's egg; 'tis somewhat rough, flat on one side, and round on the other, heavy and hard. We believe this stone was there when they were hatch'd, for let them be never so young, you meet with it always. They have never but one of 'em, and besides, the Passage from the Craw to the Gizard is so narrow, that a like Mass of half the bigness cou'd not pass. It served to whet our knives, better than any other Stone whatsoever.

"When these Birds build their Nests, they choose a clean Place, gather together some Palm-Leaves for that purpose, and heap them up a foot and a half high from the Ground, on which they sit. They never lay but one Egg, which is much bigger than that of a Goose. The Male and Female both cover it in their turns, and the young is not hatch'd till at seven Weeks end. All the while they are sitting upon it or are bringing up their young one, which is not able to provide for its self in several Months, they will not suffer any other Bird of their Species to come within two hundred yards round of the Place: But what is very singular is, The Males will never drive away the Females, only when he perceives one he makes a noise with his Wings to call the Female, and she drives the unwelcome Stranger away, not leaving it till 'tis without her

Bounds. The Females do's the same as to the Males whom she leaves to the Males, and he drives them away. We have observ'd this several times, and I affirm it to be true!

"The Combats between them on this occasion lasts sometimes pretty long, because the Stranger only turns about, and does not fly directly from the Nest. However the others do not forsake it, till they have quite driv'n it out of their Limits. After these Birds have rais'd their young One, and left it to its self, they are always together, which the other Birds are not, and tho' they happen to mingle with other Birds of the same Species, these two Companions never disunite. We have often remark'd, that some days after the young one leaves the Nest, a Company of thirty or forty brings another young one to it; and the new fledg'd Bird with its Father and Mother joining with the Band, march to some bye Place. We frequently follow'd them, and found that afterwards the old ones went each their way alone, or in Couples, and left the two young ones together, which we call'd a Marriage."

The above account, of the authenticity of which there is no reason to doubt, introduces us to a type of Bird life now extinct, but existing on the globe within historic times, and a strange interest therefore attaches to the nearest of kin to the Dodo which survives at the present moment. This is the Toothed-billed Pigeon of Samoa (*Didunculus strigirostris*). This bird, which is about the size of an ordinary domestic Pigeon, is only found in the Navigator's Islands, as Samoa is sometimes called. It has perfectly-formed wings, but until recently it never used them, as it had no natural enemies in its island home, and was accustomed not only to live on the ground, but to breed in colonies and deposit its eggs on the side of a hill. As Samoa became more civilized, however, the usual accompaniments of

civilization prevailed in the shape of cats and rats, the former devouring the birds and the latter their eggs, and speedy extermination appeared to be the fate in store for the *Didunculus*. It then appears that the Pigeons began to use their wits, and did not quite see why they should be wiped off the face of the earth, as their distant relatives the Dodo and the Solitaire had been, and they not only began to use their wings to save themselves, but changed their mode of nidification, and took to building their nests in trees. The Rev. S. J. Whitmee, who was for long a missionary in Samoa, credits the *Didunculus* with a high intelligence, and writes—"It has probably been frightened when roosting, or during incubation, by attacks of cats, and has sought safety in the trees. Learning, from frequent repetition of the fright, that the ground is a dangerous place, it has acquired the habit of building, roosting, and feeding on the high trees; and this change of habit is now operating for the preservation of this interesting bird, which a few years ago was almost extinct."[1]

Amongst the Swimming Birds there are also some remarkable forms, and some of the most curious of these are the Darters or Snake-Birds (*Plotus*), which are found in the temperate and tropical portions of both hemispheres. These long-necked birds are allied to our Cormorants (*Phalacrocorax*), and have much similarity in habits to the latter, though they are inhabitants of rivers and swamps, rather than of the sea-coasts like the Cormorants and Shags. The latter have a remarkably strong hooked bill, recalling that of an Accipitrine bird, whereas the Darters have a long thin bill which is furnished with saw-like edges turned at a backward angle like a barb, so that a fish transfixed by the unerring aim of the Darter's bill has no chance of escape, and with this bill a wounded bird is capable of inflicting a severe wound on its captor. In

[1] 'Proceedings' of the Zoological Society, 1874, p. 184.

addition to this barb-bearing bill, the Darter has a very curious "kink" in the neck, in the region of the eighth and ninth vertebræ, which accounts for the irregular curve which is seen in the bird's neck as it sits at rest. On diving after a fish, which it does with extraordinary celerity, the Darter pierces its prey through with the bill, for by reason of the muscles which are attached to the "kink," the neck is let go, as if it were a spring, and is straightened out in the act of striking. The name of "Snake-bird" is given to the Darter, from its habit of swimming with the body submerged, so that only the long, snake-like head and neck are seen above the surface of the water. In the Fish-house at the Zoological Gardens an example of a Darter is generally to be found, and the marvellous diving powers of the bird can there be studied, as well as its activity in securing a fish. It should be noticed that a Darter propels itself under water by means of its feet, and does not use the wings at all.

During the breeding season the male displays considerable power of "showing-off" to his mate, and flies in the air before her in zig-zag courses. The nests are built of sticks and placed on trees, often in close proximity and in the company of Herons and Cormorants, the eggs being chalky-white like those of the latter birds. Pelicans likewise have these chalky eggs, and in those of Cormorants and Grebes the real colour of the egg is greenish below, but this colour can only be observed by removing the outer layer of chalk.

A relation of the Darter is the Frigate Bird, often called the "Man-of-War Bird." There are two species of the genus *Fregata*, a large and a small one, *F. aquila* and *F. minor*. Both are inhabitants of the tropical seas, and are remarkable for their powers of flight, and for their somewhat raptorial habits, for they pursue the smaller Gulls and Gannets and force them to disgorge their hard-earned

prey. Mr. Fritz Jansen says that the Frigate Bird of the Ellice Islands is domesticated by the natives, and when the

The African Darter (*Plotus leraillanti*).

Rev. S. J. Whitmee was in those islands in 1870 he saw scores of them about the villages sitting on long perches

erected for them near the beach. The natives procure the young birds and tie them by the leg and feed them until they are tame. Afterwards they let them loose, and they go out to sea to get their food, and return to their perches in the villages at intervals. The statements recently made by an adventurous traveller in Northern Australia, that he made tin discs from the bottom of disused milk-tins, scrawled on them in different languages the letters which announced his derelict condition on a desert island, and then tied the discs to the necks of Pelicans, which were in hundreds upon the latter, can scarcely be credited; but Mr. Whitmee informed the writer that a post had been established on the Ellice Islands by some of the missionaries, and that the Frigate Birds were the postmen. Like our own Carrier Pigeons, they were used to take letters from one island to another, and he himself had more than once seen letters arrive in a quill which had been tied to the birds.

The old male of the Frigate Bird has a red pouch, which it is able to distend to an enormous size. The bird, figured in our sketch (p. 24), was presented to the Natural History Museum by Captain Milner, who brought it home in the freezing chamber of his vessel. Much has been written about the buoyancy of the Frigate Bird's flight, and this can easily be believed, for the body appears to be full of air-cells. When the above specimen arrived at the Museum, it was to all intents and purposes as if it had been freshly shot, and by inserting a quill down the throat, we were able to inflate the whole skin of the bird, and there was scarcely a part which was not distended with air between the skin and the actual body.

A very remarkable instance of a species which can fly when it is young, but loses the power of flight when adult, is seen in the Steamer-Duck (*Tachyeres cinereus*) of the Straits of Magellan. Mention of this Duck occurs in the

narratives of Captain Cook and the early navigators, but the best *résumé* of the history of the species is that given by Professor Cunningham, from whose work, the 'Naturalist in the Straits of Magellan,' I take the following extract—

"The first detailed account of the habits of the Steamer-Duck is given by that intelligent and accurate observer of nature, Captain Philip Parker King, in his narrative of the voyage of the *Adventure* and *Beagle*. He states that, at Eagle Bay, beyond Cape San Isidro, in the Strait of Magellan, he 'saw, for the first time, that most remarkable bird the Steamer-Duck,' and observes that, 'before steam-boats were in general use, this bird was denominated, from its swiftness in skimming over the surface of the water, the "race-horse," a name which occurs frequently in Cook's, Byron's, and other voyages. It is a gigantic duck, the largest I have met with. It has the lobated hind toe placed far backwards, and other characteristics of the oceanic Ducks. The principal peculiarity of this bird is the shortness and remarkably small size of the wings, which, not having sufficient power to raise the body, serve only to propel it along, rather than through, the water, and are used like the paddles of a steam-vessel. Aided by these and its strong broad-webbed feet, it moves with astonishing velocity. It would not be an exaggeration to state its speed at from twelve to fifteen miles an hour. The peculiar form of the wing, and the short rigid feathers which cover it, together with the power this bird possesses of remaining a considerable time under water, constitute a striking link between the Ducks and the Penguins. It has been noticed by many former navigators. The largest we found measured forty inches from the extremity of the bill to that of the tail, and weighed thirteen pounds; but Captain Cook mentions in his voyage, that the weight of one was twenty-nine pounds. It is very difficult to kill them, on account

of their wariness and the thick coat of feathers, which is impenetrable by anything smaller than swan-shot. The flavour of their flesh is so strong and fishy, that at first we killed them solely for specimens. Five or six months, however, on salt provisions taught many to think such food palatable, and the seamen never lost an opportunity of eating them. I have preferred these Ducks to salt beef, as a preventive against scurvy, rather than from liking their taste.' King also distinguished two species of Steamer-Duck, whereof one (the *Anas brachyptera* of Latham, *Micropterus brachypterus* of Quoy and Gaimard), was entirely incapable of flight; and the other, which he denominated by the specific name of *Anas patachonicus*, was stated to be smaller in size than the *A. brachypterus*, possessed of volant powers, and differing also in other points relating to the plumage. Mr. Darwin, who describes the bird as he saw it at the Falklands, mentions but one species, the original *A. brachyptera*, which he states to be incapable of flight.

"I will now pass on to offer a few remarks on the bird, as derived from numerous observations which I had opportunities of making with regard to it at the Falkland Islands, in the Strait of Magellan, and on the west coast of Patagonia. At the outset I may state that, though undoubtedly some Steamer-Ducks fly, and others appear to be either wholly incapable of flight, or do not make use of their faculties in this respect, it is, nevertheless, my belief there is only one species of the genus *Micropterus*, and that the variations in size, capability of flight, and colouring of plumage, are chiefly dependent on the age of the birds. Secondly, it is my opinion that it is the young birds that can fly, and that the power of flight or the disposition to fly diminishes with age. I have arrived at this conclusion after the examination of a number of specimens of volant and non-volant birds, having ascer-

tained by a careful inspection of the condition of the skeleton, and other points in the structure of the volant specimens (the plumage of which entirely corresponded with King's short description of *Micropterus patachonicus*), that they were all immature individuals (probably the young of the year), and having as invariably found that the non-volant specimens were full-grown birds.

"The average length of the adult birds may be stated as about thirty inches, and I do not think that I ever met with specimens measuring more than three feet from the tip of the bill to the tip of the tail, so that I am inclined to believe that the specimen mentioned by King as forty inches in length was of exceptional size, and I feel no doubt that there must have been some mistake as regards the birds stated by Cook to weigh twenty-nine pounds.

"The Steamer-Duck is very plentiful on the shores of the Falkland Islands, in the Strait of Magellan, and in the channels of Western Patagonia, as well as at Chiloe, which is the northernmost locality where I have seen it. It is generally to be observed in pairs, or small flocks of six or seven individuals, stationed on the rocks, or swimming about in the extensive beds of the 'kelp,' which girdles the coast in most spots; but, occasionally, large flocks composed of many hundreds are to be met with. When undisturbed in the water they swim quietly along, producing two peculiar notes—that of the male being a sort of mew rapidly repeated, while that of the female is a kind of deep growl—and diligently searching the fronds of the kelp for the animals to be found thereon, or diving for mussels, which appear to be one of their staple articles of diet, as I always found fragments of the shells in the stomachs of those which I examined. The stomach is a most powerful organ, with very thick muscular coats, and the lower part of the windpipe or trachea of the male possesses an enlargement of considerable size. This, which is likewise to be

met with in the males of many other species of Ducks, serves to modify the voice. At the Falkland Islands, in common with many other birds, the Steamer-Ducks are much tamer than they are in the Strait of Magellan, allowing the observer to come within a few yards of them without accelerating their speed. When alarmed at the prospect of impending danger, however, they lose no time in getting up steam, paddling through the water at a marvellous rate by dint of flapping their little wings, the motion of which is so excessively rapid, that it is difficult to convince one's self that they are not revolving, leaving a long wake of foam like that produced by a miniature steamer behind them, and not ceasing this method of progression till a safe distance has intervened between them and the object of their dread. They often assist their escape in addition by diving, and coming up to the surface at a distance of many yards in a direction upon which it is impossible to calculate, when they show their great heads for a moment, and then repeat the manœuvre. Though the rate of their speed has, I think, been considerably over-estimated by Captain King, it is yet so great as to render it impossible for a boat, however well manned, to overtake them, except by hemming them in to some small cove, where a gun may be used with tolerable chance of success. It is in general in such situations that those birds which can fly take to the wing, and those which cannot have recourse to their diving powers. Even when hit they very frequently escape, for unless they receive a very heavy charge of shot, their coat of down and feathers protects them from serious injury. Their nests, in general placed on a sloping bank near the sea, and under the shelter of a low bush, are formed principally of grass. In these four or five large cream-coloured eggs (the dimensions of which may be roughly stated as three and a half by two and a quarter inches) are deposited, and covered with a layer of soft grey down. The young brood appear

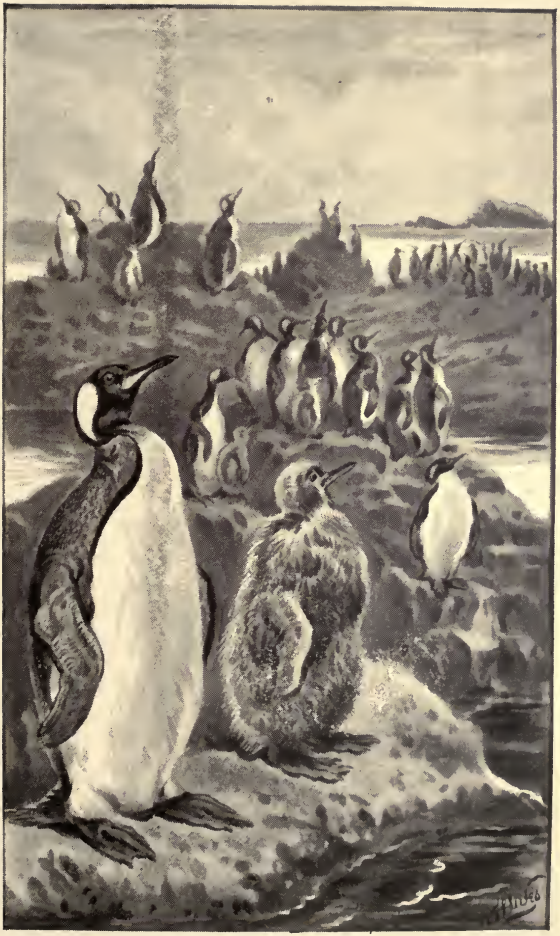
to be tended by the parent birds for a considerable period after they leave the egg, and may often be seen swimming after them. Like the old birds, they swim and dive actively, coming up after the plunge at a long distance."

Perhaps the most wonderful of all the birds which live on the globe at the present day are the Penguins, which constitute the Order *Spheniscifórmes*. Their rock-haunting and fishing habits, as well as the feeble development of their wings, have caused them to be associated in the minds of naturalists with the Auks (*Alciformes*) of the Northern Hemisphere, which the Penguins in a manner represent in the Antarctic Seas. . A slight acquaintance, however, with these two forms of birds is sufficient to dispel any idea of their affinity. However small the wings of the Auks may be, they are actual wings, and not "flippers" as in the Penguins. The latter birds cannot fly, whereas the Guillemots, Razor-bills, Puffins and other Auks can fly well, the exception having been the Great Auk (*Plautus impennis*), which, as is well known, was a flightless bird.

Penguins may, therefore, be admitted to form an Order of Birds by themselves, with no actually close ally at the present day. On land they progress clumsily, and walk in an upright position, but in the sea they are surprisingly active, and by the aid of their fin-like wings they urge themselves through the water with as much speed as some other birds traverse the air, their food consisting of fish and other marine animals. In swimming they keep their feet outstretched behind, never using them to propel their bodies through the water. Although found at considerable distances from land, they betake themselves to desolate and rocky islands for the purposes of nidification, and vast colonies of Penguins are often found on some of the islands of the Antarctic Ocean. One species, and that the largest

of the Order, the Emperor Penguin (*Aptenodytes forsteri*), is only found in the region of the icy barrier towards the South Pole. The King Penguin (*A. patachonica*), of which the accompanying illustration is a portrait, is somewhat more widely distributed, and is found from the Falkland Islands and the Straits of Magellan to Kerguelen and the islands off the south of New Zealand. Young Penguins are thickly covered with down, and the King Penguins which have lived in the Zoological Gardens have retained their clothing of brown down until they have almost reached the size of the adults. The upright position in which the birds habitually sit requires undoubtedly much strength of limb, and we find that, in the Penguins, the legs are very short and that the metatarsus is extremely broad and powerful, the three principal bones being more distinct throughout life than in other birds, and divided one from the other by deep grooves. The whole body of the Penguin is covered with small scale-like feathers, differing from those of other birds in the great breadth of the shaft and the small size of the vane; and as there are no quills or flight-feathers, the wings are more like fins in appearance. The bones are also modified in a parallel manner to the anterior limbs of Whales and Porpoises, being flattened and jointed in such a way that there is very little allowance for motion at the elbow and wrist, while the pollex or first digit is immovably fused with that of the second. Another remarkable peculiarity in the Penguin's osteology is the great breadth of the scapula or shoulder-blade, all these modifications of the skeleton tending to an enormous increase of swimming power.

The species alluded to in the present chapter are only a few out of hundreds of others I might have chosen, each exhibiting some striking characteristic, and that I have not exhausted the wonderful birds will be seen in the



Rookery of King-Penguins (*Aptenodytes patachonica*).

following chapters, where other species, just as remarkable for their form or habits, will be treated of. In these introductory pages, however, I have selected certain of the most divergent types of Bird life, and I hope that the illustrations of some of the wonderful forms which have lived on the surface of the globe in bygone times will have proved not without interest to the reader.

CHAPTER III

DECORATION IN BIRDS

The Splendid Sun-bird.

The difference in the colouring of the sexes—Evolution of Species—Sun-birds—Birds of Paradise—Lyre-birds—Motmots—Puffins—The methods by which Birds acquire their plumage.

THE decoration of a bird is, as a rule, confined to the adult male. The females and the young birds are soberly coloured in comparison with the plumage of the old male, and that this is the general rule throughout the Class *Aves* is a well-known fact. As will be seen, however, later on, there are some remarkable exceptions, in which the female has the pre-eminence in ornamentation. The acquisition of brighter colours by the male, usually so pronounced in birds, probably depends upon sexual selection in the past,

wherein the more brilliantly plumaged males would have possessed advantages over other males which had not these points to recommend them to the notice of the females. But that such an acquisition of brilliant colouring must have taken a long period of time to accomplish, is also evident, and even if the idea of sexual selection be mere theory, some of the facts which one meets with in a daily study of birds are interesting enough to make one hazard a possible explanation as to how such a development in the decoration of the male may have proceeded, even if it be impossible to give in detail the exact method by which it was accomplished. That the decorative plumage of the male bird is appreciated by himself and is used by him as an attractive presentation to win the favour of the female, must, it seems to me, be taken as an undoubted fact, whether it be the streaming plumes of a Bird of Paradise; the hundred-eyed wing of an Argus Pheasant; the coloured, and, to human notions, somewhat ugly, wattles of a Turkey or Domestic Fowl; the feathered shield of a Ruff; or the naked appendage to the head of a Bell-bird. The way in which the male birds show themselves off to the females is a proof that they believe in the charm of their decorations. That sexual selection has played a great part in the development of brilliant plumage, seems to me a most feasible conclusion, and a reasonable conjecture as to how the evolution of species may have taken place, can even be hazarded. During the process of writing the 'Catalogue of Birds in the British Museum,' which contains a description of all the species of birds known up to the time of writing the volumes, I must have handled nearly half a million of specimens, and in the volumes written by myself I have described the plumages of not less than 5000 different species, and have given references to the books in which they are mentioned, with a list of the specimens contained in the National Collection.

This has been an experience vouchsafed to no other ornithologist, and I have consequently had many opportunities of observing the wonderful complications and developments of plumage in the species I have had to describe. I have often regretted that I never followed the advice of my old friend and Mentor, Darwin, in making a series of notes, as I went along, on the laws which seem to prevail with regard to the style of colour in various groups of birds. Of late years, however, ornithologists have generally recognized that the question of *colouration* must be equally considered with that of *structure* in birds, and its importance has been universally admitted. Nor can the relations of the Orders and Families of Birds one to another ever be properly appreciated until every point of their economy has been considered, and certainly types of colouration form an important feature in classification.

The mention of the name of Charles Darwin recalls to me the time when first I knew him. I was then the Librarian of the Zoological Society in Hanover Square, and, though little more than a boy at the time, I was hard at work on my Monograph of the Kingfishers. Nothing could exceed the kindness of the great naturalist towards young beginners, and I never felt afraid of appealing to him for his opinion on any matter which puzzled me. When I was appointed to the British Museum he was still the same kind friend to me, listening to my propositions with the utmost patience and courtesy, and always giving me encouragement, which was very welcome at the time, and is now one of my most cherished memories. In those days I was young and full of enthusiasm, and I always told him of the work which I proposed to do in different branches of ornithology, whereupon he gave me this sound advice as to the method I should pursue, and I now pass it on to the younger school of ornithologists, as coming from the lips of the great master himself. He

urged me to keep separate portfolios relating to the various heads of the subject I was studying, one for "Geographical Distribution," another for "Moult," "Migration," etc., and into these portfolios were to be cast the memoranda and references relating to each subject as I came across the facts. When the portfolios grew bulky in course of time, it would then be seen whether the accumulated material was sufficient to be arranged in order, and the results published to the world. This Darwinian method of work, which he informed me was the one adopted by himself, seems to me to be an admirable plan not only for scientific workers, but for all those engaged in the study of any difficult subject. It was also a great privilege in my early days to possess the friendship of Dr. Alfred Russel Wallace, who was always ready to help me with his notes and experiences of bird-life on the Amazon and in the Eastern Archipelago. Without the loan of the specimens in his collection, it would have been impossible to have completed my Monograph of the Kingfishers.

Of the process of development from one form to another we can but form a guess, but there are one or two instances which occur to me which may be briefly noticed as of some interest. To take the family *Nectarinidæ* or Sun-birds, for example. These little birds inhabit the tropical portions of the Old World, and are found throughout Africa and India; thence they occur eastwards to Southern China, and southwards to the Malay Archipelago and Northern Australia. In their metallic plumage, extensile tongue, and even to a certain extent in their habits, they resemble the Humming-birds (*Trochili*) of America, but the resemblance is merely superficial, and the two Families have little in common with each other as far as structure and affinity are concerned. The Humming-birds are Picarian, their relations being with the Swifts (*Cypseli*), while the Sun-birds are thoroughly Passerine birds and not unlike Tits

in their ways. They are, however, allied to the Honey-suckers (*Meliphagidæ*) to a great extent, and have an extensile tongue. Like the Humming-birds, they are attracted to flowers in order to feed on the insects which frequent the latter, but they do not poise themselves in the air or hover in front of the blossoms like the Humming-birds, but cling like Tits to the stems of the flowers and extract the nectar and capture the tiny insects with their long tongue. Some of the finest Sun-birds equal in the beauty of their metallic plumage the grandest of the Humming-birds, as will be seen by our illustration of the splendid Sun-bird (*Cinnyris splendidus*) of West Africa (p. 62). Here nearly the whole plumage is metallic, and one principal decorative feature is to be seen in the bright yellow pectoral tufts which stand out on each side of the breast. These yellow tufts play a great part in the ornamentation of the male Sun-birds, and however small may be the amount of metallic colouring, the yellow tufts are always present, and hence we may argue that it is an ornament donned originally by some ancestral species and retained by the most brilliant of the succeeding species to the present day.

Thus we find the divergence of decorative colour especially marked in the males, for the females are almost invariably birds of dull plumage, and the young males at first resemble their mothers. From this point of view the characters of some of the African species are remarkably interesting. In *C. hartlaubi* from West Africa (Fig. 1) pectoral tufts are present, but the colour of the upper parts is dark olive and the breast grey. Metallic plumage only appears on the throat. The female is entirely plain. In *C. cyanolæmus* (Fig. 2) the general tint

1. The male of *Cinnyris hartlaubi*.

of the plumage in both sexes is also dull, but, besides the yellow pectoral tufts of the male, there is also a further development of metallic colour, which here extends to the forehead as well as the throat. In the male of *C. reichenbachi* (Fig. 3) we find a plain-plumaged species, but with still more metallic decoration than in *C. cyanolæmus*, for it extends not only over the crown of the head but over the sides of the face, throat, and fore-neck, while as usual the pectoral tufts are still in strong evidence;

2. The male of *C. cyanolæmus.*

3. The male of *C. reichenbachi.*

and other species can be quoted in which a gradual development of metallic colour has taken place in the male, until we meet with the beautiful *C. splendidus* here figured, which rivals any Humming-bird in the beauty of its metallic tints. If there is any possibility of the correctness of such a theory of development as I have indicated, the question may be asked: Is there a species known in which both sexes are alike, and in which the male resembles the female in plumage? I am able to state that there is such a species, in fact more than one, so that we may imagine that these represent some of the original and ancient forms of *Nectarinidæ*, in which the sexes were alike plain-coloured, and the metallic plumage has been gradually evolved by sexual selection or some other cause to their present beautiful livery. Such olive-coloured species exist in *C. olivaceus* of South Africa and *C. obscurus*

(Fig. 4) of West Africa, the males of which are olive in colour like the females of the majority of Sun-birds. Both sexes are alike plain-plumaged, and the only ornament of the male is the yellow pectoral tuft which would appear to be the first approach to a decorative plumage.

4. Head of *Cinnyris obscura*, male and female.

A further evidence of the mode in which the brighter colours may first have been donned is shown in the young birds, the males of certain species at first resembling the females, but differing from them by dusky shading in the places where the metallic colours are prevalent in the adult males, pointing out in this survival the primitive indication of progress in the male plumage from the sober colour which anciently both sexes shared. One further case occurs to my mind, that of our common Kestrel Hawk (*Cerchneis tinnunculus*). In the Birds of prey the sexes are generally alike in plumage, but the female is the larger and more powerful bird of the two. In the European Kestrel, however, the male is distinctly superior in colour to the female, the latter bird being rufous, barred with black, the tail being similarly patterned. In the male, however, the head is blue-grey, and so are the rump, upper tail-coverts and tail-feathers, the latter having a black band near the end. One sign of a very old female is the appearance of a shade of grey over the tail, as if there were a certain inherent tendency in the species towards the acquisition of a blue tail. The young male at first resembles the female and has a rufous tail, but the first indication of blue-grey colour appears on the rump and upper tail-coverts, as if the original inclination of the male to become grey had commenced in this portion of the bird's body, and had since become hereditary. The grey on the head appears

later. The same changes take place, and the same sexual distinctions are found in the Lesser Kestrel (*C. cenchris*), and it should be observed that both these species are migratory, and that they therefore pass a more vigorous existence than the species which are resident and do not migrate. Again, as in the case of the Sun-birds, one may ask: Are there any species of Kestrels representing perchance the original or ancient stock of these birds, in which the sexes are alike in colouring? And again I can point to such instances in nature, when in Africa we find certain resident species of Kestrels, *C. rupicoloides*, *C. fieldi*, and *C. alopex*, in which the male does not differ from the female in colour, and none of these species are migratory.

Returning, however, to the birds of gaudy decoration, our attention is first attracted by the Birds of Paradise, which are certainly the most fantastically-plumed birds of the world, though again in almost every genus of the *Paradiseidæ*, it is the male which has the wonderful dress which marks him as a creature apart from the ordinary run of birds. Stripped of his ornamental plumage it is very difficult to distinguish a Bird of Paradise from a Crow, and some of the Manucodes and Paradise Crows are not only plain enough in colour to recall their near alliance to the family *Corvidæ*, but, as in the Crows, the sexes do not differ in colour. With the typical Birds of Paradise, however, the case is different, and every kind of ornamental decoration is found in the Family. Thus some of the genera have shields of elongated and more or less metallic feathers, springing from the sides of the neck or chest, as in *Drepanornis*, *Epimachus*, and the allied genera of the Sickle-billed Birds of Paradise belonging to the Sub-family *Epimachinæ*. Another wonderful member of this group has dense yellow plumes enveloping the flanks, with the shafts of the feathers prolonged, so as to appear like wire

threads: hence its name of Twelve-wired Bird of Paradise (*Seleucides nigricans*).

The majority of the *Paradiseidæ* have shorter and more Crow-like bills than those above mentioned, and to the true Birds of Paradise, of the sub-family *Paradiseinæ*, belong those beautiful birds with red or yellow streamers with which we are accustomed to connect the name of the Family. These yellow-plumed birds were brought as curiosities from the Spice Islands by the ancient traders to the Moluccas, and as the sun-dried skins were given to them by the natives, who tore off the legs and also frequently the wings as well, the belief got abroad that the birds had no feet, and Linnæus actually named one species *Paradisea apoda* on account of this tradition. Perfect specimens, however, were procured by Dr. A. R. Wallace during his celebrated expedition to the Malay Archipelago, and of late years it has become rare to see other than complete specimens of these beautiful birds, as they are now procured by well-trained hunters. It is a curious fact that, however beautifully the skins may be preserved, and however carefully they may have been dressed with arsenic, the yellow flank-plumes retain their colour better in the skins of native manufacture which have never been properly cured, but only dried in the sun. Even when preserved in cabinets and kept from the light, these yellow plumes seem to fade, and when exposed as mounted specimens, the colour entirely leaves them in a few years. Although yellow, orange, crimson, and green, are colours which frequently occur among the Birds of Paradise, blue is comparatively rare and is found only occasionally as on the bald head of *Schlegelia respublica*, a bird from the island of Waigiou, which has a yellow mantle, a green breast-shield, and two long centre tail-feathers, which curl round in a half circle at the ends; the principal feature of the species, however, is its blue head, which is naked, save for a few

lines of feathers which traverse its surface. It was, therefore, a great surprise to ornithologists when, in 1885, a Bird of Paradise with *blue* flank plumes was discovered in the Owen Stanley Mountains in British (*i. e.* South-eastern)

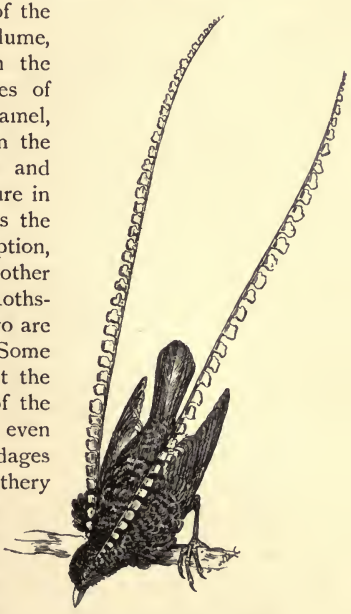
The Blue Bird of Paradise (*Paradisornis rudolphi*).

New Guinea by the late Carl Hunstein, and named by Drs. Finsch and Meyer *Paradisornis rudolphi*, after the ill-fated Crown Prince Rudolph of Austria, who was a keen ornithologist. The back and wings of the bird are also for the most part blue.

Another remarkable form is the Red Bird of Paradise (*Uranornis rubra*), in which the shafts of the two centre tail-feathers, instead of being merely narrow and wire-like as in the true Birds of Paradise (*Paradisea*), are flattened out so that they are exactly like a piece of whalebone. This curious development begins, however, as an ordinary feather, and even when the whalebone stage is reached, there is often to be found a tip of absolute feathery plume. In the true Birds of Paradise, such as *Paradisea apoda* or *P. minor*, the shafts of the central tail-feathers are produced into a kind of wire. In the young males, as Dr. Meyer has recently shown, the middle tail-feathers are at first no longer than the rest of the other rectrices, but are somewhat pointed at the end, and in the first moult they seldom seem to grow far beyond the line of the other feathers, though the vanes of the outer or inner web are sometimes wanting, predicting that in a future stage they will be absent altogether. At the second moult the feathers still maintain a good deal of lateral web, and often widen out into a narrow racket at the ends, and in successive moults they appear to be always emitted from the sheath as wire-like shafts. It is not known whether the bird nibbles any of the web off with its bill, but it is probable that, as in the case of the Racket-tailed Parrots (*Prioniturus*), the centre tail-feathers have a hereditary tendency to become wire-like, and from the figures given by Dr. Meyer, there would seem to be great irregularity in the amount of webbing to the shafts of these curiously-developed feathers.

One of the most remarkable of the Birds of Paradise, and certainly one of the most wonderful birds in the whole world, is the King of Saxony's Bird of Paradise (*Pteridophora alberti*). This extraordinary species was described by Dr. A. B. Meyer, the Director of the Dresden Museum, in 1894, and when he sent me a picture of the bird along with his original description, I could not help exclaiming

that it was impossible that such a bird could exist in nature! Velvety black above and yellowish below, there is nothing very striking in the aspect of the bird itself, which is smaller than our Song-Thrush (*Turdus musicus*), but the "streamers" which it carries! Poised in a socket on either side of the head is a long shaft-like plume, from which depends, on the lower side only, a series of little flags of blue enamel, each quite separate from the one which precedes it, and not of a feathery structure in the least. Wonderful as the bird was on its first reception, I have now seen several other males in Mr. Walter Rothschild's collection, and two are in the British Museum. Some remains of feathering at the extreme tips of some of the streamers suggest that even these enamelled appendages may be preceded by a feathery stage, but, as a matter of fact, we know that there are other birds which have enamelled ornamentation, such as the Curl-crested Toucan (*Pteroglossus beauharnasii*) of the Amazons, the Curl-crested Cuckoo (*Lepidogrammus cumingi*) of the Philippines, while even in Europe we have the Waxwing (*Ampelis garrulus*), which has wax-like appendages to the secondary quills and the tail-feathers. In all of the



King of Saxony's Bird of Paradise.

instances last mentioned, however, the ornamentation is produced by an elongation or flattening out of the shaft of the feather, so that the result is achieved by a somewhat similar process to that which produces the wire-like tail-feathers of the Birds of Paradise.

I mentioned above that it was not known whether the Birds of Paradise themselves manipulated the shredding of the webs of their shaft-like plumes. It seems impossible to believe that they could possibly do this, for in the case of the Six-plumed Birds of Paradise (*Parotia*), it is difficult to understand how the birds could ever attain their object, seeing that the six plumes spring from the sides of the head, and grow, three on each side, to a length which the bird would find it difficult to reach with its bill. The species too have differently-sized rackets at the ends, these being large in *P. sexpennis* and very small in *P. carolæ*. Again, in the King Bird of Paradise (*Cicinnurus regius*), the shaft of the central tail-feather is thin and wire-like, and ends in a metallic-green "boss" at the tip, this being of a circular form, the feather being curved round and round upon itself. Yet in younger specimens of the King Bird of Paradise we see that this metallic "boss" begins like a true feather, and curves more or less towards the point, so as to become sickle-shaped. We must accept, therefore, the theory of Dr. Meyer with regard to *Paradisea minor*, that it takes several moults before the perfect tail-feather is donned, and certainly I have seen specimens of *C. regius* in full moult, with the green-bossed central tail-feather just sprouting from the "pen," so that it is evident that when once the metallic "boss" has been attained, it is resumed in its perfect condition at each moult, and never returns to the feathered stage. *A propos* of the Birds of Paradise and their moult, it must be said that even in this function they are most remarkable birds and totally unlike Crows, for they seem to moult their feathers in great patches, so that

when the new ones are developed, large portions of the bird's body are covered with pen-feathers, the sheaths of which are as conspicuous as they are in young Kingfishers and other Picarian Birds.

While on the subject of gaudy decoration in birds, we

The Lyre-bird (*Menura superba*).

must notice one instance of the ornamentation of the tail, which is equal to anything exhibited by the Birds of Paradise, or by any other bird in existence. This is seen in the Lyre-birds of Australia, and they are among the many *bizarre* types of birds which are found in that portion of the globe. At first sight the Lyre-bird looks like a kind of

Game-bird, and especially resembles some of the Megapodes in colour. It is, moreover, furnished with feet of large size, which again remind us of the Mound-builders. There can, however, be no doubt that the *Menura* is a Passerine Bird, and not a Game-bird at all. There are three kinds of Lyre-bird, the common species, *M. superba*, Queen Victoria's Lyre-bird (*M. victoriæ*), and Prince Albert's Lyre-bird (*M. alberti*), all of them occupying different districts of the Australian continent, and each having its peculiar distribution. Owing to the beauty of the species and the interest attaching to them, the birds have been much shot down of late years, and in some places are in danger of extinction. Full-plumaged males are very rare in collections, as it takes four years before they gain their complete livery, and even then the beautiful tail is moulted after a very short time. The Lyre-birds, on account of their wonderful tail, must be reckoned among the most fantastically ornamented birds in the world, and no other bird quite equals them for peculiar decoration. The filamentous character of the long feathers is produced in the usual way, viz. by the absence of barbules or hooklets, and the barbs, which constitute the chief part of the web of a feather, are situated at about a quarter of an inch from one another, so that there is a very wide interval between them, and this imparts a hair-like appearance. In this same way the light feathery plumes of the Birds of Paradise can be accounted for, as they show the same filmy character as does the Lyre-bird's tail. Notwithstanding the solid aspect of the broad outer feathers in the latter, their structure is one of the most wonderful of any bird. The outer web is very narrow, and the inner web broad and of a chestnut colour. At regular intervals appear to be notches of light pattern, but on closer examination it will be seen that these are not real notches, but are intervals in the feather where there are no barbules, so that these interspaces look more or less transparent.

When proceeding through the brush-wood the male Lyre-bird carries his tail horizontally, but on his playing-ground it is erected and displayed to its fullest capacity. The dancing-ground is a small round hillock, according to Gould, on which the male is constantly trampling, at the same time erecting and spreading his tail in the most graceful manner, sometimes pouring out his own natural notes, at others mocking those of other birds, and even the howling of the Dingo. The nest is a domed structure, and not unlike that of a gigantic Wren's nest. The nestling is an extraordinary little creature for a young Passerine bird, for it is covered with dense fluffy down, like that of a Storm-Petrel. No other Perching Bird has such a nestling, and that alone is sufficient to show that, independently of their wonderful tail-ornament, the Lyre-birds have other peculiarities which justify their being placed in a separate Order of Birds, *Menuræ*. Queen Victoria's Lyre-bird is said to construct a nest in every way recalling that of our European Dipper, which makes not only a real nest but an outer structure as well. It builds a small nest of strong fine roots, lined with feathers, and about five inches high and ten inches in diameter. The outer covering is composed of sticks, grass, and moss and leaves, and forms a projection over the genuine nest, the opening of which is in the side, and Dr. Becker says that the female always enters backwards, with *her tail laid over her back*, and with watchful eye and ear, keeps her head in the direction of the opening. A nestling is described by the same observer, as still covered with down, though it was a bird of more than a foot in length, and had feet nearly as big as those of its parent. It is evident that the young Lyre-birds must remain in the nest for a considerable time in a helpless condition, as the specimen in question lived with Dr. Becker for eight days, during most of which time it slept in a nest of moss, and became quite tame, accepting all

kinds of food, but as to its walking, Dr. Becker says—"When it rose, it did so with difficulty, the wings assisting. Once on its legs, it ran sometimes, often falling down, however, in consequence of the want of strength to move properly the large and heavy bones of its legs." When adult, however, the Lyre-birds have immense strength in their legs, and have been known to jump from the ground to a branch of a tree fully ten feet off, and then bound by similar leaps to the other branches.

Prince Albert's Lyre-bird is said to be superior in voice and power of imitation to the common species, and Mr. A. A. Leycester, in his account of the bird on the Richmond River in New South Wales, states that "one of these birds had taken up its quarters within two hundred yards of a sawyer's hut, and he had made himself perfect in all the noises of the sawyer's homestead—the crowing of the cocks, the cackling of the hens, the barking and howling of the dogs, and even the painful screeching of the sharpening or filing of the saw." Like many other birds of beautiful decoration, the Lyre-bird has its playing-ground in which to disport, and each pair of birds appears to have its own particular district, and does not encroach upon that of its neighbours. I have already alluded to the playing-ground of *Menura superba*, and the manœuvres of *M. alberti* would seem to be very similar, except that its song is finer than in the other species, just as it is also a better mimic. Mr. Leycester has watched these birds performing, and says that, when singing, they spread their tails over their head like a Peacock, and droop their wings to the ground, and at the same time scratch and peck up the earth.

Although in the case of many species which have rackets or wire-like feathers, we are ignorant as to the fact whether the birds assist in trimming them with their bill, with the Motmots (*Momotus*) the case is different, for here we know that the birds do actually trim their centre tail-

feathers so as to make them form a racket at the end. This has been shown to be the case by Mr. Osbert Salvin, who instances that of a young Motmot imbued with the

A Motmot at work.

hereditary instinct that it had to nibble the web away from its longest tail-feathers, but was evidently puzzled to find the right one, as at first all the tail-feathers are of the same length. Thus it had nibbled at one feather after the other

and chipped pieces out of them, until at last the centre feathers extended beyond the others, and on these the bird finally commenced to form its racket. How glad it must have been when the two centre tail-feathers began to extend beyond the others, so that it knew exactly on which it had to work! Motmots are inhabitants of the Neotropical region, that is to say, the whole of Central America south of the plateau of Mexico, and the entire continent of South America. Throughout the greater part of this region Motmots are found, excepting the extreme south. They are Picarian birds, allied to the Kingfishers, and have a saw-like edge to the bill, which may be of use to the young bird in its first moult, when the necessity of trimming its central tail-feathers first impresses itself on its mind. In habits the Motmots are rather sluggish, and they might be well called "Pendulum Birds," from the way in which they sit at rest on a bough, swaying their tail backwards and forwards like the pendulum of a clock. They make their nest, like a Kingfisher, in the hole of a bank, tunnelling to a distance of from six to nine feet, and depositing their four white eggs in a chamber where a few dry sticks constitute the so-called "nest."

One of the most interesting examples of the assumption of decoration during the breeding season is seen in the Puffin (*Fratercula arctica*) of the British coasts. This is one of the Auks (*Alcidæ*), and belongs to the same family as the Great Auk (*Plautus impennis*), which, owing to its inability to fly, its feeble wings being insufficient to carry its large body through the air, has become extinct during the present century. The Puffin, on the other hand, is a bird of strong powers of flight, and is often to be seen far out at sea, like the Guillemots, Razorbills, and other members of the family of Auks. Our common Puffin has the remarkable habit of moulting certain portions of its bill. The latter in summer is grey, crossed with bands of

yellow, and with the tip carmine. There is an orange wattle at the corner of the mouth, and above and below the eye is a grey horny wart or protuberance. These wattles are shed, as also is a large portion of the brightly-coloured bill, these parts being renewed in the following summer. A similar phenomenon is seen in the American Knob-billed Pelican (*Pelecanus trachyrhynchus*), which, during the breeding season, has a horny excrescence on its bill which afterwards falls off.

A Puffin in the nesting season, showing the facial ornamentation afterwards shed.

The phenomenon of a bird assuming ornamental features on its face during the breeding season, and then moulting them like ordinary birds moult their feathers when the season comes for their change of plumage, is certainly a wonderful one. The method by which birds assume their different phases of colouration has as yet not been sufficiently studied, but the most frequent mode of change is

undoubtedly by a complete moult. Most of the species we are familiar with as summer visitors moult their feathers before undertaking their autumn migration, and in nearly every case they cast their old feathers and go south with perfectly renewed plumage. The young birds, though they may be thickly spotted and differ from the adults in this respect, as, for instance, does our Common Flycatcher (*Muscicapa grisola*), leave us in a full dress indistinguishable from that of the parent bird. The young of the Warblers, such as the Willow-Warbler, Chiffchaff, Great Sedge-Warbler and others, can only be distinguished from the old birds in their winter habitats by showing a little more yellow tinge on the under surface, and even this is not observable in the following spring, when young and old return in perfectly full plumage. This is, however, because the Warblers have a spring moult also, and, before they return to their northern breeding-haunts, they cast all the feathers with which they departed, and return to us in the freshest of new plumage. This is certainly true of our familiar migrants, and Thrushes (*Turdidæ*) can be distinguished from Warblers (*Sylviidæ*) by the fact of their having spotted young, and by their having only an autumn moult, and not a spring moult as well. Thus our Robin and Nightingale are Thrushes and not Warblers, as they have so often been called. An ordinary species, like our Song-Thrush (*Turdus musicus*), begins its life with a spotted plumage, and then moults in its first autumn to a dress so like that of the old birds, that it is only by the indication of small spots on the tips of the wing-coverts that it can be determined as a bird of the year. The Swallows, however, do not moult in the autumn like other migrants, but leave Europe in the same plumage in which they arrived in the previous spring, while the young birds go south in the feathering they acquire before leaving the nest. Thus the old birds depart in a very ragged

costume, worn and battered with long service in the nesting and bringing up of the young, and by the time that they have effected their retreat to their winter home in Africa, they are scarcely recognizable as the brilliant little birds which come to us in the spring. The blue plumage is worn and bleached to a dull brown, the red on the forehead and throat become white, and the flight-feathers and those of the tail are worn out and jagged. Some specimens killed in the late autumn in England, show here and there a feather in process of renewal by moult, but as a rule all the Swallows commence their moult in December, when they are far from Europe, and it is not until February that they have gained their new and beautiful plumage, when they at once begin their journey northward.

Many birds seem to be always more or less in moult, notably Gulls and Birds of Prey, and it is interesting to see that complete correspondence in the shedding of the wing-feathers takes place, so that if the sixth primary is being renewed on one wing, it will be found that the same primary is also in process of renewal on the other wing. But besides this regularity of moulting as the means of the renewal of plumage, there are certain exceptions to the general rule that all feathers are renewed by an absolute casting of the plume. Take, for instance, Redstarts, Buntings, and some of the Finches—there being no better example than our House-Sparrow (*Passer domesticus*) of a change of plumage without moult. In the autumn after the Cock Sparrow has renewed his feathers and put on his winter dress, he presents a much duller and browner appearance than he does in the perky plumage of the summer. The grey head appears brown, of the black throat there is no trace, excepting perhaps on the chin, and yet our little friend will put on his perfect dress in the following spring without casting a single feather. The light edgings to the plumes, which hide the grey colour of the head and the black of

the throat, become abraded as spring approaches, and the tips are gradually shed, so that the underlying colours come to the fore, and the black feathers which we see on the throat of the Sparrow are the identical ones which were acquired by moult in the preceding autumn, and which throughout the winter have appeared to be brown or grey, owing to the light edgings with which the summer plumage has been overlaid. The same takes place in the Buntings and other birds, for in the Snow Bunting (*Plectrophenax nivalis*) and the Reed Bunting (*Emberiza schœniclus*) any one can prove the truth of this phenomenon, by lifting the feathers of the winter plumage, when the summer plumage will be found concealed by the lighter edgings of the former period, and the basal portion of the feathers will be found to represent the forthcoming summer dress, which will be completed when the light margins of the plumes shall have been shed. This fact can be studied by any one who examines a Cock Sparrow killed in winter. The Black Redstart (*Ruticilla titys*) and the Pied Flycatcher (*Ficedala atricapilla*) are likewise birds which have their summer plumage obscured by pale margins to the feathers in winter, and these birds have been known, when in confinement, to attain their full summer plumage without the shedding of a feather, and merely by the abrasion and wearing off of the pale margins. The late Professor Taczanowski told me once an extraordinary tale with respect to one of these birds. He said that he could not swear to the truth of it, as it did not occur to himself, but it was vouched for by one of his friends, who was a Polish nobleman and a thorough naturalist, and Taczanowski said that he himself believed the story to be perfectly true and reliable. The naturalist in question shot a Pied Flycatcher one evening in spring, when the birds were about to nest, but the bird he had killed was in grey plumage still, but with indications of the black dress coming rapidly on.

Not having time to skin the bird the same evening, the hunter put it into a drawer of his dressing-table, and on proceeding to take it out next morning, he was surprised to find that during the night the process of change had continued, and that the bird was nearly black. It is many years since my old friend told me this story, and it seemed so extraordinary that I never liked to put it into print, but in the light of recent conclusions it seems that it may as well be published, as Taczanowski himself never doubted its authenticity.

Besides the acquisition of new plumage by the process of moult and by the shedding of the light edges of the feathers in spring, there is yet a third method, viz. by a change in the pattern of the feather, without moult. It is many years since I became convinced of the truth of this phenomenon, and I published my first essay on the subject in 1873, 'On the Changes of Plumage in certain Accipitrine Birds.'[1] I then endeavoured to show that the change from a striped feather, such as that on the chest of a young Sparrow-Hawk (*Accipiter nisus*), to a barred one, could be, and was, effected by the breaking up of the pattern of the feather, instead of its being shed and renewed. During the twenty-five years that have elapsed since I first put my ideas before the public, I have been more than ever convinced that this phenomenon takes place in many other groups of birds besides the Sparrow-Hawks, though I never could prove *how* the change of pattern was effected. I could now give numerous instances in which no one can doubt that such a change takes place, however mysterious it may seem that such a thing could be possible. One of the best examples is that of the Australian Rifle-bird (*Ptilorhis paradisea*), in which the male is velvety black, with a beautiful triangular shield of burnished steel-green extend-

[1] 'Proceedings of the Zoological Society,' 1873, p. 414.

ing over the throat and fore-neck. The female, on the other hand, is a plain ashy-brown bird, with the under surface whitish, transversely barred with black. The young male is at first like the mother bird, but the change to the plumage of the adult male is not entirely accomplished by a moult, but many of the feathers actually change their pattern. Even some of the quills become black by a gradual extension of the latter tint over the brown of the original feather. The bars on the breast of the young male are of a horse-shoe pattern, and these gradually break up into irregular lines, and the feathers begin to darken on their edges, and it is here that the colour ultimately becomes of a velvety green.

Mr. Ogilvie-Grant has recorded the same fact with regard to the way in which the female of the Red Grouse (*Lagopus scoticus*) attains her full dress.[1] "In some birds the whole of the alteration of the plumage of the flanks is produced by change of pattern in the old autumn feathers, in others the change is entirely produced by moult, while sometimes both methods are employed by the same individual. In the former case, the first indication of the coming change may be observed in the beginning of November, or even earlier, when many of the flank-feathers show traces of an irregular buff stripe or spot near the terminal half of the shaft. As the bird only changes about half its flank-feathers, these buff marks are only to be observed on such as are destined to undergo alteration of pattern, which, roughly speaking, means every second or third feather. The buff spot gradually enlarges and spreads along the shaft, then becomes constricted at intervals, and broken up into patches which gradually extend laterally towards the margins of the webs, forming wide irregular buff bands. Meanwhile the interspaces become black, and the rufous of autumn dies out.

[1] 'Handbook to the Game-birds,' vol. i. p. 32.

"When the summer feathers are supplied by moult, they usually begin to make their appearance about the beginning of March, and even when fully grown, may generally be recognized from those produced by change of pattern, by their more regular black and buff barring. The change of pattern without a moult appears to take a long time to become complete, for we find that, though autumn feathers, altered in this way, begin to show traces of the coming metamorphosis as early as the beginning of November, the colours are often imperfectly arranged by the end of April. When the summer feathers are supplied entirely by moult, no change whatever is visible till about the end of February, when the first new feathers begin to appear, though we have noted a single instance of a summer feather making its appearance as early as the middle of December.

"There can be no doubt that the male Red Grouse completes his autumn moult much more quickly than the female does, many males being in full autumn plumage by the beginning of September. Possibly this may be accounted for by the resources of the female being more severely taxed than those of the male during the breeding season. It may very naturally be asked why some females should change their summer flank-feathers by moult, while others are enabled to arrive at the same result by going through the much less exhaustive process of redecorating their old autumnal feathers and making them serve the purpose of new breeding plumage. This is a difficult question to answer, but it seems natural to suppose that the more vigorous birds gain their summer flank-feathers by moult, while Nature has enabled the weaker individuals to obtain the necessary protective nesting plumage by a more gradual and less exhaustive process."

The possibility of a change of pattern in feathers without a moult was vigorously denied in England, when I mooted the subject in 1873, and more recently Professor J. A.

Allen of New York wrote a paper in which he ridiculed the ideas on the subject, which had received attention from a number of European naturalists of the highest repute, since the year 1820 and onwards. His memoir is a complete *résumé* of all that has been written on the subject, and as to his conclusions, I join issue with him at once. Professor Allen writes—"The perfected feather, though worn for from a few weeks to a year, according to the species and the character of the feather, is in one sense practically a dead organ, inasmuch as it is insusceptible of further growth or repair." As to the replenishing of the barbules of a feather after they have once become lost, Professor Allen is doubtless right, as such a thing would be impossible. A barbule once lost must be lost for ever, and certainly could not be replaced. In the case of a deficiency in this respect, the only possible renewal of the pattern of a feather would be by a complete moult of the feather in question. It is, therefore, a little surprising that so good an observer as the late Heinrich Gätke could suppose that the Wood-Sandpiper (*Rhyacophilus glareola*), after having the white notches on the quills worn out by reason of the abrasion of the barbules, could renew the latter, involving a reinstalment of the structural portion of the feather. Gätke was apparently unaware of the spring moult in Wading Birds, and it is certain that the Wood-Sandpipers with worn-out markings of the quills did not replace them by any restoration of the pattern of the old feather, but simply by a complete moult. Professor Allen's criticisms have been challenged by Mr. J. G. Millais in the 'Ibis' for 1896 (p. 451), whose conclusions agree with those of myself and other European naturalists as to the possibility of a change of pattern in certain species. His proofs are confined to certain Grebes and Wading-birds, but in 1897 Dr. Chadbourne made some valuable experiments on the colouration of feathers in the Bobolink (*Dolichonyx*

oryzivora), and has shown by microscopical examination that the perfect feather of a bird is by no means "dead," as has been supposed, but is full of life, and that the "colour change in the individual feather is *fact, not theory*" ('Auk,' xiv. p. 145). This is the evidence which ornithologists have been waiting for for years, for, although to myself the change of pattern in a feather was an evident fact, I had never the time to follow up the subject, and find out *how* it was possible for a feather to act in this method of change of pattern, though the fact that it *must* do so was too frequently forced upon me to admit of any doubt as to the possibility of the phenomenon.

CHAPTER IV

DECORATION IN BIRDS (*continued*)

The Poise of a Humming-bird (after Ridgway).

Humming-birds—Difference in plumage between male and female—The Racket-tailed Humming-bird—Bell-bird—Umbrella-bird—Great Crested Grebe—Standard-winged Nightjar—Huia.

AMONG the highly coloured birds of the world the Hummers take a foremost place, for the majority of the species are bedecked with metallic plumes of brilliant tint, while the variety in form and adornment is equalled in no other Order or Family of Birds. The Humming-birds, in fact, stand alone in the class *Aves*, and have no very close allies. Their flight is of extraordinary rapidity and their power of hovering more than wonderful, so that in many of their actions they resemble the Hawk-moths or *Sphynges*,

being seen here for a second hovering in front of a flower, with wings so quickly vibrating as to be almost invisible to the eye, while in another second they are hovering many yards away. Professor Ridgway, of the United States National Museum, who has written an excellent monographic account of the Humming-birds, thus describes the flight of a member of the Order—"It often towers above the trees, and then shoots off, like a little meteor, at a right angle. At other times it quietly buzzes away among the flowers near the ground. At one moment it is poised over a diminutive weed, at the next it is seen at a distance of forty yards, whither it has vanished with the quickness of thought. During the heat of the day the shady retreats beneath the trees are very often visited: in the morning and evening the sunny banks, the verandahs and other exposed situations are frequently resorted to."

At the present time about five hundred species of Humming-birds are known, and though a few of them visit the United States in summer, the bulk of the species are confined to what is called the Neotropical region, which comprises Central and South America. Some of the Humming-birds, such as the members of the genus *Phaethornis*, are plainly coloured, with the sexes alike, but the majority have brilliant metallic colours confined to the male sex, the females being of much more sober tints. It has been pointed out that this dull colouration is of a distinct advantage for the protection of the eggs, as the nest is built in an exposed position, being generally a little cup-shaped structure of moss or wool, and thus the sitting hen would be a conspicuous object if she carried the flaunting metallic plumage of the male birds. Among the Humming-birds we find the most extraordinary examples of decorative plumage, and the ornaments are of all kinds—metallic crests, backs, throats, breast-shields, etc; but no one of all the Order is more remarkable than the

Racket-tailed Humming-bird (*Loddigesia mirabilis*). It well deserves its specific name of *mirabilis* or wonderful, for it is certainly one of the most extraordinary birds in existence. It was first discovered at Chachapoyas in Upper Amazonia, and was described by Gould in 1847, and to conceive of the way in which the majority of the Humming-birds are restricted to a limited area, I may state that Mr. Gould offered a large sum to travellers about to visit South America, if they would bring him back

The Racket-tailed Humming-bird (*Loddigesia mirabilis*).

specimens of the *Loddigesia*, and yet up to the time of his death in 1881 he had never succeeded in obtaining an example of this rare species, which up to that time remained unique in the Loddiges collection. In 1880, however, the celebrated Polish traveller Stolzmann revisited the town of Chachapoyas, whence the original example came from, and succeeded in rediscovering the species. He writes as follows—[1] "It seems to be restricted to the basin of the Utcubamba, a little river on the right bank of the system of the Marañon, and is only found at an altitude

[1] Taczanowski, '*Ornithologie du Pérou*,' vol. i. p. 321.

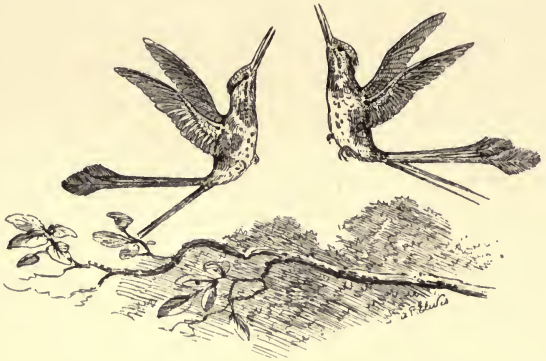
of between 7000 and 9000 feet above sea-level. The country is bare of forest, and it is only in its southern portion that one meets with the Montaña of Puma-Urcu, which, so to speak, joins with the forests of Huayabanba, that is, with the principal mass of the forests of Northern Peru. The remainder of the country inhabited by the *Loddigesia* is covered with cultivated fields, pastures, or brush-wood, and there is a system of small valleys and ravines with a somewhat richer vegetation, and containing here and there groups of large trees, probably the survivors of the ancient forests. The greater part of these areas is covered with almost impenetrable thickets of a thorny plant, called *Zarza* (Peruvian Strawberry), mixed here and there with alders. It is in these thickets that the *Loddigesia* dwells, appearing to avoid the large forests bare of the flowers necessary for its subsistence.

"A beautiful *Alstromeria*, with a red flower, seems to be its favourite flower, as one can make sure of finding the *Loddigesia* wherever this flower is met with. The plant flourishes from the month of August up to the end of November. As this flower is not visited by the *Lesbia gracilis*, which is the Humming-bird which most persistently persecutes the *Loddigesia*, the latter feeds at its ease. It loves also to visit the flowers of a sort of spring strawberry and also a certain tree called by the natives *Tola*, which is apparently a kind of myrtle. The female is likewise observed on the little violet flowers of a species of Pimento called in this part of the country '*Aji*.'

"Nowhere can this Humming-bird be said to be common. On the contrary, it must be considered to be a rare species, and the full-plumaged males are decidedly scarcer than the females and the young males. From morning till evening the birds are in continual motion. Whilst some Humming-birds appear to have their hours of rest, and others abandon themselves to the performance of

a song, one never sees the *Loddigesia* inactive for any length of time. The females are not so shy as the adult males, and their flight presents no difference from that of other Humming-birds, but it is perfectly wonderful to observe the incredible swiftness and precision with which it passes across the densest thickets, where the bird is obliged to change the direction of its flight many times in a second in order to avoid the obstacles which it encounters at every turn of its course. On arresting its flight at the calyces of the flowers, the *Loddigesia* balances its tail in the same way as the long-tailed *Lesbia* and other Humming-birds. The two lateral tail-feathers of the adult male are so arranged in flight, that the two rackets mutually approach each other. This operation is effected mechanically; as the tail-feathers are able to turn themselves to a certain point in their basal tube, the slightest opposition in the air suffices to produce a similar position. One can prove this in recently killed specimens. These tail-feathers remain therefore crossed, and the further point of this crossing takes places quite close to the commencement of the rackets.

"The humming noise produced by the hen bird in its flight can be easily distinguished, after a slight experience, from that of the long-tailed *Lesbia gracilis*, its persistent persecutor. It emits a higher note, which is to be explained by its shorter wings. The male, which has even shorter wings than the female, produces a humming in a still higher key, and one can detect the presence of a male bird by its humming alone, without even seeing it. The *réunions* in which the *Loddigesia* indulges, constitute one of the most interesting facts in the bird's economy. The observations were made by me at Osmal, where two or three males gathered together, and later at Tamiapampa, where from five to eight immature males, of the same age, used to assemble and carry out their curious manœuvres. In the



Young Males of the *Loddigesia* at play.

latter locality there was nothing which could apparently attract the birds it was an open plateau, with some scattered bushes, which offered a minimum of shade. There were no flowers, and the birds only assembled there to go through their evolutions."

Two young males would arrest their flight in the air, *vis-à-vis*, with the body suspended in a vertical position, opening their tails, turn and turn about, so that the outer tail-feathers with their rackets formed a straight line perpendicular to the long axis of the bird, as they darted from side to side. Each time that the bird opened its tail, was heard a little dry sound like the snapping noise made by two finger-nails or the sound made in shutting a watch.

"My later observations," says Mr. Stolzmann, "made on the Manakins, and the analogy of the stiffening of the secondary quills, induce me to believe that it is the mutual concussion of these stiffened feathers which makes the sound that which one can hear at ten paces' distance. The elongated under tail-coverts rest in their natural position, being independent of the system of the muscles of the rump, which are strongly developed.

"The manœuvre lasts for quite twenty seconds. It is ordinarily executed by two young males; but sometimes, as I have already remarked, a larger number take part in it. One can nearly always hear the voice of a female bird in the neighbourhood. At Tamiapampa ten minutes did not pass but these manœuvres were repeated, and the birds have their chosen places for the performance. On the plateau mentioned above they had a favourite thicket. At Osmal there were two such, and the birds seldom went through their manœuvres elsewhere. By concealing oneself quietly in the neighbourhood I could observe them for as long as I wished."

Mr. Stolzmann speaks of another evolution still more

out of the common. A young male would rest suspended underneath a thin branch, whilst another would perform above him, spreading its tail and clicking. They would change their position in the twinkling of an eye, when the second bird would hang under the branch, and the other would take its turn in the air above it. "It would be curious," says the naturalist above-mentioned, "to know the object of such evolutions. Can it be a kind of exercise, or a form of rivalry? If it could be for either of these reasons, how comes it that the adult males so seldom appear to take part in the performance, though they pass by very often? Only once have I seen an old male arrest his flight in front of a young one." The adult birds in showing off their tail would sometimes give an extraordinary position to the outer tail-feathers, so that the two rackets would range themselves above the bird's head. This unique movement of the tail observed by Stolzmann would be represented by the raising of the tail on high, the rackets thus covering the head, while the body of the bird is constricted in front. It is often more easy to observe the rackets than the bird itself, and thus a man often fails to shoot it if it turns towards the hunter, as its varied breast is easily confounded with the neighbouring objects. When the bird is flying in the shade the rackets are also easy to distinguish.

Stolzmann has seen one of these Humming-birds drinking the water of a brook, in which it had sought out a little cascade, and one can well understand that it is only in such a manner that it can assuage its thirst. Such tiny cascades abound all over the country inhabited by the *Loddigesia*. It was just before sunset, and he observed the bird at a distance of three paces.

The note of the adult male is not known, but the young males and the females utter a cry *tsi-tsi-tsi!* rapidly repeated. It is heard when the birds visit flowers or during their manœuvres; when at rest, they utter no sound.

In November a female was seen collecting moss for its nest, and this was the season of the manœuvres.

That the wonderful tail of *Loddigesia mirabilis* is nothing more than ornamentation, cannot be doubted, and it is equally certain that the rackets are rather a hindrance to the bird's flight, and not an assistance, as was supposed by Gould. The tail is wonderfully formed, for in the females and young males ten tail-feathers are present, as in the majority of Humming-birds, but the adult male has only four. The two central ones are very tiny and scarcely visible, while the other pair are developed into wire-like plumes, with the large racket at the end ; these cross each other twice. The long-pointed feathers which we see in the picture of the *Loddigesia* are not really tail-feathers, but are under tail-coverts developed to an inordinate length. Mr. O. T. Baron, who was at Chachapoyas in 1895, occupied the same Hacienda that Mr. Stolzmann had lived in, but it was now in ruins, so that he had to pitch a tent, the spot selected for which was near a thick bush in full flower. "Hardly was the tent up," says Mr. Baron, "when I heard the familiar sound of the wings of *Loddigesia mirabilis*. Immediately other arrangements were left and my gun seized. I saw a beautiful *Loddigesia* in the bush, too near to shoot. The thought came over me to save the bird for observation, for which I have never been sorry, though I may have lost a very fine specimen by doing so.

"Shortly after, a female bird arrived and settled upon a small limb. Immediately the male bird discontinued feeding and flew towards the female, the tail so spread that the spatules were protruded in front of his bill. In this position it hovered for a short time, when a young male appeared on the scene. The adult male discontinued his performance and sat upon a little branch. The young one hovered before it, flying from side to side for about ten inches, and flipping its two long tail-feathers at every extreme of its

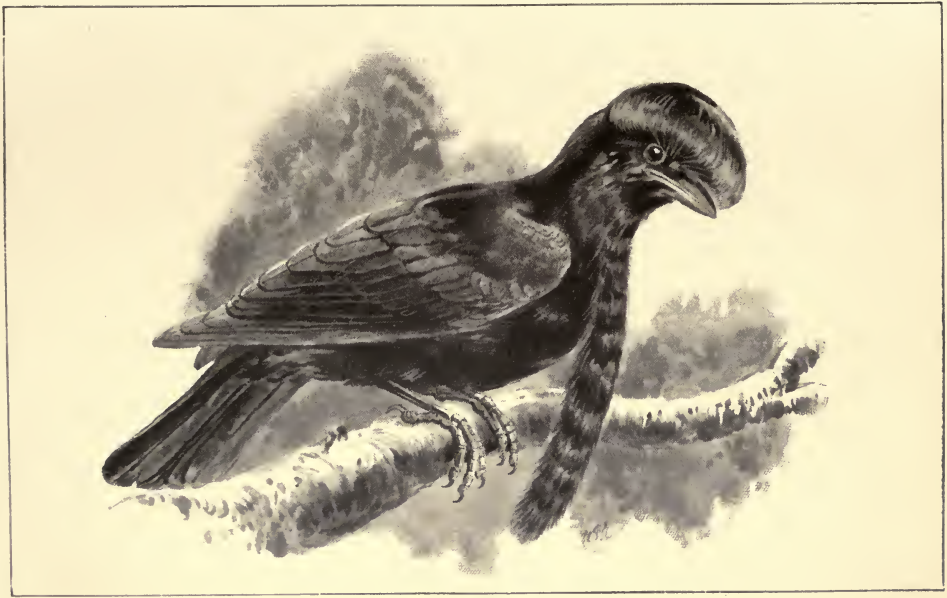
course, producing a sound as if two fine leather belts were flapped together. The old male soon tired of the performance, forced the young one to sit down, and then performed himself in the same way, but he flipped the spatules together *above*, instead of *below*, the tail as the young one did. At times the adult male would also fly before the female from side to side, making a noise with the spatules that could be heard thirty yards away. If the young one returned alone, he would attack a dry leaf furiously, peck at it, and flap the tail for many minutes at a time.

"Once two young birds met, attacking each other. The sitting bird would watch the flying one, moving its head from side to side, and then suddenly slip off the branch into a hanging position. The flying bird would still attack it; yet the hanging one, though imitating death, had its eyes open." [1]

Although Humming-birds have no actual song, as we understand it, yet they produce extraordinary noises with the wings during the nesting time, which are supposed by those who have heard them to correspond with the love-notes of other birds during the breeding season. Thus Mr. Kershaw, writing of the Broad-tailed Humming-bird (*Selasphorus platycercus*), observes—"During the mating, and perhaps also through the entire breeding season, the flight of the male is always accompanied by a curious, loud, metallic, rattling noise, which he is enabled to produce in some way by means of the attenuation of the outer primaries. This is, I think, intentionally made, and is analogous to the love-note of other birds. Though I saw many of these birds in the fall, it was only very rarely that this whistling noise was heard, and then with greatly diminished force."

Mr. Ridgway says that he has heard the above-named

[1] 'Novitates Zoologicæ,' vol. iii. p. 10.



Ecuadorian Umbrella-bird (*Cephalopterus penduliger*).

species make a shrill, screeching noise, something like that made by a rapidly revolving circular saw when rubbed by a splinter, when the males were driving off any other Humming-bird from the vicinity of their nests. At these times the little aggressor would rise to a considerable height in the air, and descend upon its enemy like a flash of lightning.

Irritability and curiosity are the characteristics of the Humming-birds, and sometimes the tiny creatures will hover right in the face of an intruder, and they often show but little shyness with human beings, though, when kept in confinement, they do not long survive. They fight continually with one another in a wild state, and will even attack birds of far greater bulk than themselves. Of the way in which they hover in flight, Mr. Robert Ridgway, in his essay on the Humming-birds, has given a figure in his account of *Calothorax lucifer* from Mexico, which is here copied (p. 90).

In South America we meet with some birds which illustrate what I would call plain or simple decoration, as opposed to the gaudy decoration of the Birds of Paradise and the Humming-birds. Examples of this are seen in the Bell-birds and the Umbrella-birds, as they are called. The common Bell-bird (*Chasmorhynchus niveus*) is an inhabitant of Guiana, and in addition to its snowy-white plumage, which in itself is beautiful enough, it has also a simple ornamentation in the scantily-feathered horn which is found on the forehead of the male, and is capable of being raised at will when the bird is calling and uttering the clear metallic cry from which it derives its popular name. The female, on the other hand, is of a dull greenish colour. That the *horn* on the fore part of the crown is actually ornamental and serves no functional purpose, is evident from the fact that the allied species, the Three-wattled Bell-bird from Central America (*Chasmorhynchus tricarunculatus*), has three

long caruncles on the head, which are not elevated or moved in any way, and are certainly only ornaments of the male sex. The inflation of the Bell-bird's wattle is effected through the palate, and is apparently managed in somewhat the same way as the distension of the male Bustard's pouch, which opens under the tongue (*see* p. 247). Waterton says that the note of the Bell-bird is loud and clear, like the sound of a bell, and may be heard at a distance of three miles. After a toll has been uttered by the bird, there comes a pause, then another toll, and then another pause. Then perhaps will follow a silence for some six or eight minutes, and then tolling commences again. The Trinidad species (*Chasmorhynchus variegatus*) is said to have a note like that of a cracked bell, but that of the Brazilian Bell-bird (*C. nudicollis*) has a remarkable resemblance to the striking of a hammer on an anvil, as I have heard myself in the case of individuals in confinement. Prince Max of Neu-Wied, who travelled in Brazil in the early part of the century, and who was one of the best field-observers that ever lived, tells us that the species is named by the Portuguese "Ferreiro," or "Blacksmith," and when several birds are calling to each other at the same time, the effect is quite remarkable, as the birds utter their note with an interval of about a second between each. When giving vent to its extraordinary note, the bird accompanies the latter by a jerk of its tail.

Another instance of simple but effective ornamentation is seen in the Umbrella-birds of South America. Like the foregoing species, these wonderful birds belong to the Family of Chatterers (*Cotingidæ*), which is exclusively American. There are three species, the Amazonian Umbrella-bird (*Cephalopterus ornatus*), inhabiting Amazonia, and ranging from Bolivia to Ecuador, Colombia, and Guiana, being replaced in Western Ecuador by *C. penduliger*, and in Veragua and Costa Rica by *C. glabricollis*, which

Great Crested Grebe (*Podicipes cristatus*).
(From specimens in the Natural History Museum.)

differs from the others in having the whole of the throat naked and of a red colour, as well as the caruncle which proceeds from the throat. In the Amazonian Umbrella-bird and its ally from Western Ecuador, this long caruncle is densely feathered, and forms a kind of dew-lap. The "Umbrella" consists of a sort of hood formed by the feathers of the forehead and crown, which are long, and curve over at the ends. All the species have a peculiar and far-sounding cry, and are all inhabitants of forest-country, from the depths of which their note resounds. When uttering this note, the bird spreads its crest, waves its pendent neck-lappet, and bows its head as it pipes. There is not so much difference in the colour of the sexes in the genus *Cephalopterus*, the female being only slightly duller in colour, and having the crest and dew-lap much less developed.

In certain forms of birds, however, we find that the sexes are alike in colour of plumage, and even in decoration. One of the most striking examples of this phenomenon, which is extremely rare in the Class *Aves*, is exhibited by the Grebes (*Podicipedidæ*). Even in our familiar little Dabchick (*Podicipes fluviatilis*), both male and female put on the same plumage in summer, and from the silvery breast and brown upper surface of the winter dress, they become black above and below in summer, and show a considerable amount of chestnut on the sides of the head and neck. The young of the Grebes are also peculiar, and are streaked with black and white like little Zebras. One of the most curious instances of assimilation in ornamental decoration of the sexes of a bird is exhibited by the Great Crested Grebe (*Podicipes cristatus*). Here the two birds are coloured alike, the tippet assumed during the breeding season being donned by both male and female, so that there is practically no difference in colour between the sexes, except that the head-dress of the female is not quite

so large as that of her mate. This is quite an exceptional occurrence among birds, as the male is usually so much more brilliantly coloured than the female; where any difference exists in the colour of the sexes, and certainly among Water-birds, wherever there is divergence in the plumage of male and female, the beauty of the former is very marked. This is especially the case with Ducks, where the male is much more brilliantly coloured than the hen bird. In Geese and Swans, however, as well as in Penguins, Auks, Gulls, Petrels, and Divers, the sexes are almost exactly alike, and few of these birds exhibit any particular ornamentation, such as I have alluded to above in the case of the Great Crested Grebes. Here both male and female have the snowy white breast so much in demand among ladies for jacket-trimming and for muffs, and in summer they put on ornamental tippets in both sexes. This species is becoming much more common in England of late years, as protection has been afforded to it, and it is a great ornament to our inland waters. Quite recently a pair of these handsome birds have taken up their abode on the lake in Wimbledon Park, and have successfully reared their young. The latter have a pretty striped plumage, and show also a bare patch of bright red on the crown, which is not seen in the adult birds, so that in the Great Crested Grebe we have an ornament in the young individuals which is not continued when the bird becomes adult. The nest which this species makes is a flat one of rushes and water plants, and it is generally easy of discovery, as it is built out in the lake on the edges of the standing reeds, and the eggs can be seen from some distance, as the nest is nearly level with the water. I have found several such nests on the Norfolk Broads in places where they are preserved, but in certain localities they are found in colonies during the breeding season, and nest in dense reed-beds. Grebes have a curious habit of covering

The Standard-winged Nightjar (*Cosmetornis vexillarius*).

the eggs on leaving the nest, so that these are often quite concealed. I have found many nests of the Little Grebe (*Podicipes fluviatilis*) which looked like a mass of decayed and rotting water-plants, and have been somewhat surprised on disturbing the covering to find a number of eggs underneath. The eggs, which are at first white, soon become stained by their surroundings, and in many instances are even quite cold, so that it would not appear that they are covered up by the birds for the sake of being hatched out by the fermentation of the decayed water-plants, as has been supposed. In the case of the Great Crested Grebe, Seebohm distinctly states that he found the eggs, where the complement was complete, covered up with damp moss and quite warm, whereas those nests which had only one or two eggs were uncovered and the eggs cold.

It is of course during the breeding season that the decorative faculty in birds is displayed to the utmost, and every bird that possesses any striking or fantastic ornaments displays them for the attraction of his mate. This is especially the case with Game-birds, some of the Pheasants making a great exhibition of their beautiful colours at the season of nesting, but perhaps one of the most interesting assumptions of nuptial ornament is to be seen in two African Nightjars. In South America the most fantastic of the family *Caprimulgidæ* is the Fork-tailed Nightjar of Brazil (*Hydropsalis lyra*), which has an extravagantly long forked tail. In Africa the wings of two of the Nightjars show an extraordinary development. Thus the Standard-winged Nightjar (*Cosmetornis vexillarius*) of the Zambesi is remarkable for the elongation of the seventh and eighth primaries, while the ninth is developed into a streamer, which floats to a distance of nearly two feet behind the bird. It is also found on the West Coast of Africa in the Niger region, and on the waters and

lakes of Nyasaland. The birds appear to be strictly crepuscular in their habits, and resemble other Nightjars in this respect, as they do not fly in the daytime; but Sir John Kirk mentions, as an extraordinary experience with the Standard-wing, that he has seen the males come off in flocks of about fifteen, and fly over the surface of the Nyasa Lake, when a sudden storm has come on and raised a surf sufficient to prevent his boat from landing. The other remarkable species is the Pennant-winged Nightjar (*Macrodipteryx longipennis*), which is noticed on p. 277.

Not very often in the class of Birds do we meet with structural differences between the two sexes, such variation as is exhibited being mostly one of colour, and not of form. In New Zealand, however, we have a wonderful instance of the difference of form in the male and female Huia, or Wattled Starling (*Heteralocha acutirostris*), where the male has a stout conical bill, and the female has a long curved one. In colour the two sexes are exactly alike, being glossy black all over, with a broad white band at the end of the tail, while a large orange wattle is present on each side of the gape, but the difference in the shape of the bill is extraordinary, as will be seen by the figures in the accompanying picture. And there is, moreover, a use for these two divergently shaped bills, for, according to Sir Walter Buller, the food of the Huia consists principally of the Hu-hu grub, which is "the larva of a large nocturnal beetle, and infests all decayed timber, attaining at maturity to the size of a man's little finger. Like all grubs of its kind, it is furnished with a horned head and horny mandibles."

On offering one of these to the Huia, the bird would seize it in the middle, and at once transfer it to its perch, and then placing one foot firmly upon the grub, he would tear off the hard parts, and then throwing the creature

The Huia (*Heteralocha acutirostris*).

upwards to secure it lengthwise in his bill, would swallow it whole. Two birds which were captured for Sir Walter Buller by a native, were kept by him in confinement, and he says that they were most interesting pets, and used to caress each other with their ivory-white bills, and throw themselves into a variety of attitudes. By placing a tree-trunk in their cage he was able to watch their habits closely, and to discover the use of the differently shaped bills in the male and female. After probing the log provided for them, which contained numbers of Hu-hu grubs, the birds would attack any part where the wood seemed soft and rotten; then commenced the work of the male, who would use his strong bill like a Woodpecker's, and chisel out the soft wood till the grub was exposed to view, when the female would insert her more slender curved bill and drag it out. In its native wilds in New Zealand the Huia is nowhere a common bird, and inhabits but a very limited area of forest country, but now that it is protected by Government, there may be some chance of this wonderful bird not becoming extinct, as has been feared by many naturalists. There can be little doubt that the Huia is a Forest-Starling, and is allied to the extinct *Fregilupus* of Réunion.

An extraordinary instance of decoration was recently shown me in an unfledged nestling of the Gouldian Weaver-Finch (*Poephila gouldiæ*) from Australia. Dr. A. G. Butler had received the specimen in question from Mr. H. St. Quintin, in whose aviary it had been bred, and I never saw a more wonderful little object. It was still quite blind and entirely bare of feathers, but besides some bars on the tongue and palate, there were three bright little rounded warts, like beads, at the angle of the mouth. Two were emerald green and one blue, and they all had a pearly or opalescent lustre. One naturally inquires what can possibly be the object of such brilliant decoration in a blind and

helpless nestling, for the ornament can appeal to no one but the little bird's own parents. Another instance in which a young bird has a coloured wattle at the gape, which disappears in the adult, is that of the Red-tailed Weaver-Finch (*Erythrura cyanovirens*) of Samoa.

The palate.

The bead-like wattles on the gape.

Ornamental markings in the nestling of the Gouldian Weaver-Finch (from the specimen bred by Mr. H. St. Quintin, and described by Dr. A. G. Butler in the 'Avicultural Magazine' for November 1898).

CHAPTER V

THE PLAYING-GROUNDS OF BIRDS

Satin Bower-bird (*Ptilonorhynchus violaceus*).

The meeting-places of the Birds of Paradise—The drawing-room of the Argus Pheasant—The assemblies of the Cocks of the Rock—Bower-builders—Gardeners.

THE consideration of the ornamental plumage of birds led me to speak of the Lyre-birds, where I mentioned for the first time a "playing-ground." This phenomenon, however, is not altogether so rare among birds as one might have believed, and there are many species which have their place for showing off, nor are they always birds of brilliant appearance or decoration, for the instinct is strongest perhaps in the Bower-birds (*Ptilonorhynchidæ*), which are none of them very brightly dressed. Many of the Birds of

Paradise have meeting-places, where the males show off their splendid plumage. A tree is selected by them as a dancing-ground, and sometimes as many as twenty adult males will assemble and go through various manœuvres, flying from branch to branch in a state of great excitement, and quivering their beautiful long flank-feathers of red or yellow.

Of the Red Bird of Paradise of South-eastern New Guinea, *Paradisea raggiana*, the following account of an assembly has been given by Messrs. Chalmers and Wyatt—"One morning we had camped on a space of the Owen Stanley Range, and being up early, to enjoy the cool atmosphere, we saw on one of the clumps of trees close by six Birds of Paradise, four cocks and two hens. The latter were sitting quietly on a branch, and the four cocks, dressed in their very best, their ruffs of green and yellow standing out, giving them a handsome appearance about the head and neck, their long flowing plumes so arranged that every feather seemed combed out, and the long wires stretched well out behind, were dancing in a circle round them. It was an interesting sight. First one and then another would advance a little nearer to a hen, and she, coquette-like, would retire a little, pretending not to care for any advances. A shot was fired, contrary to our expressed wish; there was a strange commotion, and two of the cocks flew away, but the others and the hens remained. Soon the two returned, and again the dance began and continued long. As we had strictly forbidden any more shooting, all fear was gone; and so, after a rest, the males came a little nearer to the dark brown and certainly not pretty hens. Quarrelling ensued, and in the end all six birds flew away."

Many Game-birds also have their playing-places, and this is particularly the case with the great Argus Pheasant (*Argusianus argus*). This remarkable bird is an inhabitant

of the Malay Peninsula, Siam, and Southern Tenasserim, as well as the island of Sumatra, but in Borneo a smaller species (*A. grayi*)) lives, and in Tonquin a different kind is found, belonging to another genus, *Reinhardius*, which has not the secondary quills developed to such an extent as in the common species. The Argus Pheasant of the Malay countries is one of the most splendid birds in existence, and, like its namesake, has indeed a "hundred eyes." The whole of the outer web of the secondaries, which are moreover of enormous size, is decorated with circular spots of white, yellow, and rufous, surrounded by a ring of black, and it is from these eye-like spots that the bird gets its name. In captivity the Argus often displays his wonderful plumage, much as the Peacock exhibits his train for the admiration of the female, by throwing up his wing and bringing it forward towards the ground, so as to display all the series of spots on the secondaries. The late Mr. William Davison, who explored Tenasserim for years in pursuit of natural history specimens for the great Hume Collection, has given the best and indeed the only account of the habits of the Argus Pheasant with which I am acquainted. One peculiarity about the bird's life is that the males and females live apart, and the latter appear to have no fixed residence, but wander about the forest, only occasionally visiting the male bird in his "drawing-room," as Mr. Davison calls the playing-ground. The hen bird, he was told, builds a rude nest in some dense cane-brake, and lays seven or eight eggs like those of a domestic Turkey, hatching them out and bringing up the nestlings without any assistance from the male bird. The latter in fact appears to be almost wholly devoted to the keeping of the drawing-room in order, and is by no means of a quarrelsome disposition. In some parts of Tenasserim the Argus Pheasant is quite a common bird, and many males are found inhabiting the same forest district. If a gun be fired, every

one of the birds within hearing begins to call, and on any alarm or excitement, such as a troop of Monkeys passing overhead, they immediately give vent to their note, which sounds like "*how-how!*" repeated ten or a dozen times. This note is given out at short intervals when the male is in its clearing, and is answered by every other male in the vicinity. Mr. Davison says that the female has quite a different note, which sounds like "*how-owoo, how-owoo!*" the last syllable much prolonged, repeated ten or a dozen times, but getting more and more rapid, until it ends in a series of "*owoos*" run together. The call-notes of both the male and female Argus travel to an immense distance, that of the former especially being heard at a distance of a mile or more.

The "drawing-room" consists of some open level spot, sometimes chosen down in a dark gloomy ravine, entirely surrounded and shut in by dense cane-brakes and rank vegetation; sometimes on the top of a hill where the jungle is comparatively open, from which the male bird clears everything in the shape of dead leaves or weeds for the space of six or eight yards square, until nothing but the bare earth remains, and thereafter he keeps this place scrupulously clean, carefully removing every dead leaf or twig that may happen to fall on it from the trees above. The food of the Argus consists chiefly of fallen fruit, as well as of ants, slugs, and insects. The birds feed in the early morning, and all come down to the water to drink about ten or eleven a.m., and the males then retire to look after their drawing-room for the rest of the day.

Mr. Davison says that in his opinion these cleared spaces are undoubtedly dancing-grounds, but he was never able to catch one of the birds actually dancing in them. The proprietor was always either seated quietly in the clearing or was moving slowly backwards and forwards, calling at short intervals. Except in the hours of feeding or drinking

in the morning and evening, the male Argus Pheasants were always to be found at home, and they roost in the trees close to their clearing. They are remarkably shy birds, inhabiting the depths of the dense evergreen forests, and are most difficult of approach, as they dive into the impenetrable thickets on the first suspicion of danger, and never fly if they can escape by running, even when pursued by a dog. Even if the hunter manages to approach the playing-ground so stealthily that only a few yards separate him from the calling bird, the latter has always disappeared when at last he is able to see into the clearing through the dense intervening foliage. It is therefore impossible to shoot the birds, but they are somewhat easily trapped, when once their playing-ground is discovered.

Thus Mr. Davison himself used to catch them by building a hedge of cut scrub round the playing-ground, and leaving four openings for the bird to enter by, each furnished with a running noose attached to a bent sapling, but the Malays take advantage of the idiosyncracy of the Argus to keep its clearing scrupulously clean, and act accordingly. "A bit of bamboo, about eighteen or twenty inches long and a quarter of an inch wide, is shaved down till it is of the thickness of writing-paper, the edges being as sharp as a razor. This narrow pliant piece ends in a stout sort of handle at one end, six or eight inches long, which is driven firmly into the ground in the middle of the cleared space. The bird, in trying to remove it, scratches and pecks at it, endeavouring to dig it up, but finding all its efforts vain, it twists the narrow pliant portion several times round its neck and takes hold of the bamboo near the ground with its bill, then giving a sudden spring backwards to try to pull it up. The consequence is that its head is nearly severed from its body by the razor-like edges of the bamboo.

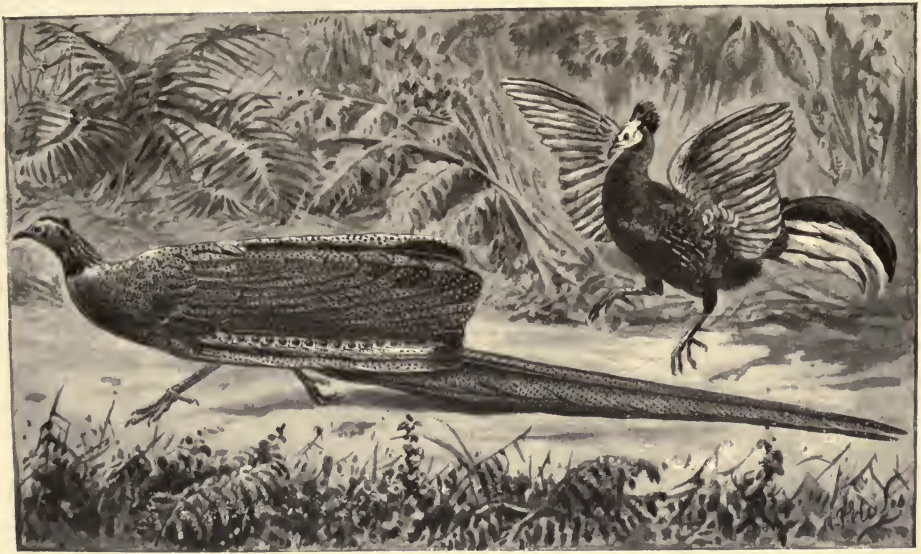
"Another method is to erect two small posts, about four feet high and three feet apart, in the clearings, across the

top of which a bar is firmly fastened. Over this bar a string is run, by one end of which a heavy block of wood is suspended just under the bar, while the other end is suspended to a peg lightly driven into the ground immediately beneath the block. The bird, commencing as usual to clear away these obstructions, soon manages to pull up the peg and thus release the heavy block of wood, which falls and crushes it."[1]

The Argus sometimes suffers from its lack of pugnacity, and is flaunted on its own hearth by the more aggressive Fire-back Pheasant of Tenasserim (*Lophura rufa*). The same excellent field naturalist, whose writings I have quoted above, tells the following story—

"I noticed on one occasion a very curious thing. I had stalked an Argus, and while waiting to obtain a good shot, I heard the peculiar note, a sort of *chukun, chukun!* followed by the whirring noise made by the male Fire-back, and immediately after saw a fine male bird run in to the open space, and begin to chase the Argus round and round its own clearing. The Argus seemed loth to quit its domain, and yet not willing to fight, but at last, being hard pressed, it ran into the jungle. The Fire-back did not attempt to follow, but took up a position in the middle of the clearing and recommenced the whirring noise with its wings, evidently as a challenge, whereupon the Argus slowly returned, but the moment it got within the cleared space, the Fire-back charged it and drove it back into the jungle, and then, as before, took up its position in the middle of the space, and repeated its challenge. The Argus immediately returned, but only to be again driven back, and this continued at least a dozen times, but how much longer it would have gone on I cannot say, for a movement on my part attracting the birds' attention, they caught sight of me, and instantly disappeared in the jungle

[1] 'Stray Feathers,' vi. pp. 428, 439 (1828).



An Intruder.

before I could fire. The Argus never made the slightest attempt to attack the Fire-back, but retreated at once on the slightest movement of the latter towards it, nor did I see the Fire-back strike the Argus with either bill, wings, or spurs."

A similar kind of meeting-ground or playing-arena is prepared by other species besides the Game-birds, and one of the Passerine birds which indulges in this amusement is the Cock of the Rock (*Rupicola crocea*), of Guiana and Amazonia. (*See* frontispiece.) It must be a curious sight to watch an assembly of these beautiful birds, gathered round to the number of twenty or more, males and females, while some of the males "take the floor." The plumage of the adult is of a bright orange colour with a beautiful curved crest on the crown, while the secondaries are square at the ends and form ornamental plumes. When dancing, the bird droops his wings, waves his crest from side to side, and hops along with most peculiar steps. The late Clarence Buckley, the explorer of Ecuador, told me that he has seen the males of the Blood-red Cock of the Rock (*Rupicola sanguinolenta*), in a state of frantic excitement, chasing each other through the forest, clinging to the trunks of the trees, and displaying their beautiful plumage to the utmost extent. A third species, *R. peruviana*, also of a red colour, inhabits Peru, where Stolzmann says that it frequents the forest country from 2000 to 5000 feet, and builds its nest on almost inaccessible rocks, laying two white eggs. He says that it is called by the natives *Tungi* or *Coutsch-pishcou*, which means "Bird-Pig." It has the most disagreeable cry of any bird he has ever heard, and the only comparison he can think of is to that of a person being sick. The first time he heard it, he thought it must be the cry of a monkey, and not that of any bird.

It is, however, among the Bower-birds (*Ptilonorhynchidæ*) that we find the most striking instances of Bird Architecture in the way of playing-grounds and arbours, and it must be

remembered that these are designed only for amusement, and in no way have anything to do with the nesting of the species. The Australian Region certainly presents us with some of the most extraordinary birds in the world, forms which occur there and nowhere else, and one can well understand the enthusiasm of John Gould when he undertook his celebrated expedition to Australia in 1837, to study for himself the birds and mammals of that wonderful Continent. If only for its Mound-builders and Bower-builders the country would be remarkable, but in every group of birds Australia possesses some extraordinary forms which differ from those of other districts of the globe, although some of them extend to the Papuan sub-region. Thus we have the great Frog-mouths (*Podargi*), representatives of our Nightjars, but differing from the latter in their nesting-habits, as they construct a nest of sticks on the branches of trees, instead of laying their eggs on the bare ground. The Giant Kingfishers (*Dacelo*) likewise belong to the Australian Region, and among Passerine birds we find Diamond-birds (*Pardalotus*), Crow-shrikes (*Strepera*), Robin-Flycatchers (*Petræca*), Lyre-birds (*Menura*), Superb Warblers (*Malurus*), Striped Warblers (*Amytis*), Emu-tailed Warblers (*Stipiturus*), Bristle-Birds (*Sphenura*), Scrub Birds (*Atrichornis*), Australian Leaf-Warblers (*Sericornis* and *Acanthiza*), and many other peculiar genera of Grass-Birds too numerous to mention in a little work like the present. An abundance of Honey-suckers (*Meliphagidæ*) is another feature of the Australian Region, and the Weaver-Finches (*Ploceidæ*) are plentifully represented, but none of its inhabitants are more remarkable than the Bower-birds.

Of these there are several genera, the members of which erect playing-grounds, excepting the Cat-birds (*Ælurædus*), which, as yet, have not been found to do so. The nest of one of these species, the Queensland Cat-bird (*Ælurædus*

Nest of the Queensland Car-bird (*Ælurædus maculosus*).
(From a photograph by Mr. A. J. North.)

maculosus), has been discovered during the last few years, and the accompanying picture has been drawn from a photograph which was sent to me by Mr. A. J. North, the Curator of Ornithology in the Australian Museum. It will thus be seen that these Cat-birds build a nest very much like that of an English Jay. The one in question was found by Messrs. Cairns and Grant in the Bellenden-Ker Range in Queensland. It was placed in the fork of a sapling about seven feet from the ground, and was a neat bowl-shaped structure, composed of long twigs and leaves of a *Tristania*, lined inside with twigs and the dried wiry stems of a climbing plant. On the outside several nearly perfect leaves of the *Tristania* were worked in, and partially obscured one side of the nest. The nests of the Satin Bower-bird (*Ptilonorhynchus violaceus*), Regent-bird (*Sericulus melinus*), and Spotted Bower-bird (*Chlamydodera maculata*), have also been discovered, and they are similar in structure to that of the Cat-bird here figured. The eggs are of a reddish buff or stone-colour, and resemble in tint those of the Birds of Paradise and Rifle-birds, to which the Bower-builders are so nearly allied that many ornithologists consider them to belong to the same family.

The Satin Bower-bird is the best known of these feathered architects, especially in this country, where, even in confinement in the Zoological Gardens, the birds construct their arbours of sticks. The male of the Satin Bower-bird (p. 117) is glossy black, and the female green.

The accompanying photograph illustrates the bower of *P. violaceus*, and has been photographed by Mr. A. J. North. It shows a bower found near the Jerulan Caves in New South Wales in October 1898. How that grand old naturalist, John Gould, would have revelled in these faithful pictures of the haunts of his beloved Australian birds! In his collecting days there was no photography to aid him in portraying his jungle-pictures, and his coloured

illustrations of the 'Birds of Australia' were painted by his devoted wife, who accompanied him on his voyage of discovery.

It was the sight of one of these bowers in the Sydney Museum that first stimulated Gould to search for them himself, with the result that he discovered several in the

The Bower of the Satin Bower-bird (*Ptilonorhynchus violaceus*).
(From a photograph by Mr. A. J. North.)

cedar-brushes of the Liverpool Range, where they were built in the most retired part of the forest, under the shelter of the branches of the overhanging trees. The construction of a bower has been minutely described by Gould, and his account cannot be improved upon. First of all there is a base or platform somewhat convex in shape, composed of firmly interwoven sticks, and on this platform the bower

itself is built. It consists of sticks and twigs, the latter of a more slender and flexible description, with their bases firmly interwoven into the platform, but with the tips bent inwards so as nearly to meet at the top. The forks of the twigs are always arranged so as to turn outwards, and thus a clear passage is made down the centre of the arbour, without offering any interference to the gambols of the bird. The female assists a little in the construction of the bower, but the male is the principal performer, and in his courtship to the lady, as detailed by that excellent observer, the late F. Strange, the cock bird becomes greatly agitated, chases her about, seizes a bright feather or large leaf in his bill, utters a curious kind of note, sets all his feathers erect, runs round the bower, and becomes so excited that his eyes appear ready to start from his head, while he continues opening first one wing and then the other, uttering a low whistling note, and, like the Domestic Cock, appears to be picking up something from the ground.

The bower, of which Mr. North has sent the photograph, is described by him as being built on a platform of sticks and twigs about three inches in thickness, the bower being composed entirely of thin twigs slightly arched, some of them meeting and crossing each other. One of the peculiar features connected with the construction of the bower is its decoration, in which the builders indulge a curious fancy. Bright feathers and dead leaves form a principal element in the adornment of their playing-ground, but far beyond these in worth appear to be the bleached bones of animals and shells, which the male evidently thinks likely to be of the highest attraction to the female. With these the entrance to the arbour is plentifully strewn, and Mr. North's photograph shows the Golgotha-like appearance. In this case, he says, there were "twelve pieces of bone of a small Wallaby (consisting of portions of the skull, ear-bones, lumbar vertebræ, and small bones of the feet), three pieces

of moss, a spray of *Acacia* blossom, some small seed-cones of an *Eucalyptus*, the egg-bag of a spider, six specimens of a land-shell, which Mr. Charles Hedley informs me is an unnamed and remarkably keeled and depressed variety of *Thersites gulosa* of Gould, and one specimen of *Helicarion verreauxi*." Gould also mentions the partiality for bright Parrots' feathers which the Satin-birds evince; and their

Double-arched Bower of the Spotted Bower-bird (*Chlamydodera maculata*).
(From a sketch by Mr. A. J. North.)

propensity for appropriating any small article is so well known to the natives that they at once search the bowers in the neighbourhood for anything that is missing.

All the species of Spotted Bower-birds (*Chlamydodera*) are expert architects, but instead of making a platform of sticks, they make a trench on either side, and plant their sticks in it so as to make an arched bower. Large numbers of shells are used in their decoration, and the late Sir George Grey narrates that he found some of the arbours of

The Regent-bird (*Sericulus melinus*). (Three-quarters of natural size.)

the Large Spotted Bower-bird (*Chlamydodera guttata*) at some miles' distance from the sea-shore, and yet the birds had decorated their playing-ground with sea-shells and other marine *débris* which they must have transported all the way.

A little while ago Mr. A. J. North sent me a sketch of a curious bower made by the Spotted Bower-bird (*C. maculata*), in which the curve of the arched twigs had been continued above and formed into a second arch. The lower bower measured about two feet, the one on the top (which was in the centre) one foot. There was the usual complement of bones, also a few of Eley's cartridge-cases.

The run of the Spotted Bower-bird is longer than that of the Satin-bird, as can be seen by any one examining our specimens in the Natural History Museum. Gould describes the arbours of the former species as being outwardly built of twigs and beautifully lined with tall grasses, so disposed that their heads nearly meet. The decorations are very profuse, and consist of bivalve-shells, crania of small mammalia and other bones bleached by exposure to the rays of the sun, or from the camp-fires of the natives. "Evident indications of high instinct," he says, "are manifest in the formation of the bower and in its decoration, particularly in the manner in which the stones are placed within it, apparently to keep the grasses with which it is lined fixed in their places: these stones diverge from the mouth of the run on each side so as to form little paths, while the immense collection of decorative materials are placed in a heap before the entrance of the avenue, the arrangement being the same at both ends. In some of the larger bowers, which had evidently been resorted to for many years, I have seen half a bushel of bones, shells, etc., at each of the entrances. I frequently found these structures at a considerable distance from the rivers, from the borders of which they alone could have procured the shells and small round pebbly stones, the

collection and transportation of which must be a task of great labour. I fully ascertained that these runs, like those of the Satin Bower-bird, formed the rendezvous of many individuals."

One of the handsomest of the Bower-birds is the Regent-bird (*Sericulus melinus*), which builds its bower in the thick scrub much in the same way as *Ptilonorhynchus violaceus*, and like that species, the structure is supported on a platform of sticks, into the interlacements of which the upright twigs are fixed. The Regent-bird evidently has an eye for the artistic, as a bower found by Dr. E. Pierson Ramsay was filled with land-shells belonging to five or six species, while several kinds of berries of various colours gave it a very pretty appearance; besides these there were several newly-picked leaves and young shoots of a pinkish tint. Another observer states that he once found a bower of the Regent-bird in a secluded place in the scrub, and so concealed by small shrubs that he had to crouch on his hands and knees to get to it. The ground in the immediate vicinity for about a foot and a half was swept clear of leaves, and his attention was called to it by the actions of the male bird which was playing on the ground, jumping up and down, puffing out its feathers, and rolling about in a very odd manner. The nest made by the Regent-bird is a flimsy structure of a few sticks. It has recently been described by Mr. A. J. Campbell, a well-known Australian Oologist, as of such a loose nature—merely a few twigs forming a flat shelf about five inches across—that it fell to pieces on removal from the tree, and it was wonderful how the eggs retained their position in it.

Still more remarkable is the bower made by the Golden Bower-bird (*Prionodura newtoniana*), a species which frequents the Bellenden Ker-range in Queensland, where it was discovered in 1883 by Mr. Kendal Broadbent. At first only the female bird, which is of a very dull olive-

Arbour of the Gardener Bower-bird (*Amblyornis inornata*). (From the drawing by Dr. Beccari.)

brown colour, was known, but the male was shortly afterwards procured by Mr. Meston, and proved to be a very beautiful golden-coloured bird with a broad crest of the same colour on the head. This Bower-Bird inhabits the mountains from 4000 to 5000 feet elevation, and the above-named naturalists state that, like other members of this Family, it has a wonderful imitative faculty, and is as great an adept at mimicry as the Lyre-bird. Commencing by croaking like a Tree-frog, the bird proceeds to give vent to a low, soft, musical, pathetic whistle, to be followed immediately by an astonishing imitation of apparently all the birds in the scrub. But it is in the construction of its bower that the *Prionodura* stands alone among its Australian fellows, for it builds an arbour up to six and eight feet in height, which must be the work of many seasons and probably of many individuals, for it is stated that birds of both sexes and all ages, both old and young, use the playground. The bower is generally built between two small trees, about four or five feet apart, and is constructed of small twigs and sticks. A pyramid of sticks is piled against each tree, and these are connected by an arch-shaped causeway of stems of climbing plants, both the pyramids and the arch-way being decorated with white moss and clusters of green fruit resembling wild grapes. Not content with raising this great bower, the birds find further scope for their architectural instincts in building a number of subsidiary dwarf hut-like structures, which are made by bending towards each other strong stems of standing grass and capping them with a horizontal thatch of light twigs. These little huts Mr. Broadbent calls 'gunyahs," and he says that he has found five of them in a space ten feet in diameter, so that they give the spot exactly the appearance of a miniature black's camp. In and out of the "gunyahs," and from one to the other, the birds pursue each other to their hearts' content.

My readers will not fail to have noticed the account of the extraordinary pyramid of sticks which the *Prionodura* is found raising against the trees which support the bower. This feature in arbour-building is still more strikingly illustrated in the play-ground which the Gardener-bird (*Amblyornis inornata*) of New Guinea erects for its delectation and amusement. The home of this little bird is in the great mountain ranges of that wonderful island, and the discovery of its bower or playing-ground is due to the great Italian naturalist, Dr. Beccari, who says that the natives call it Tukan Kobon, which means "a gardener." Another name they give it is "Buruk Gusra," or "Master Bird," as it is such a master of the songs and screamings of numerous birds, that it drove Beccari's hunters to despair, so frequently were they deceived by the imitations of the *Amblyornis*. It is a somewhat curious coincidence that, like the Golden Bower-bird, the *Amblyornis* was described originally from a dull-coloured female specimen, and received the somewhat inappropriate name of *inornata*. For twenty years none but females or immature birds were received by museums, and it was only quite recently that the male was discovered, and he was then found to have an enormous crest of brilliant orange, so that instead of being "unadorned," as the name *inornata* would imply, he possesses a very striking and beautiful decoration in the form and colour of his top-knot.

The playing-ground of the Gardener Bower-bird is certainly one of the wonders of the world. Dr. Beccari's account of its discovery must be given in his own words —"I had just killed a small new species of Marsupial, *Phascogale dorsalis*, which balanced itself on the stem of a great tree like a Squirrel; and turning round, I suddenly stood before a most remarkable specimen of the industry of an animal. It was a hut or bower close to a small meadow, enamelled with flowers. The whole was on a

diminutive scale. I immediately recognized the famous 'nests' described by the hunters of Bruijn, but I did not then suspect that they had anything to do with the constructions of the Bower-builders. After well observing the whole, I gave strict orders to my hunters not to destroy the little building. That, however, was an unnecessary caution, since the Papuans take great care never to disturb these nests or bowers, even if they are in the way. The birds had evidently enjoyed the greatest quiet until we happened, unfortunately for them, to come near them. We had reached the height of about 4800 feet, and after half-an-hour's walk, we were at our journey's end.

"*The Bower.*—I now had full employment in the preparation of my treasure, and I gave orders to my people not to shoot many of the birds. The bower I had first seen was the nearest to my halting-place, and one morning I took colours, brushes, pencils, and gum, and went to the spot, where I made the sketch which I now publish. While I was there, neither host nor hostess were at home, and I could not wait for them. My hunters saw them going in and out, when they watched their movements to shoot them. I could not ascertain whether this bower was occupied by one pair, or by several pairs of birds, or whether the sexes were in equal or unequal numbers—whether the male alone was the builder, or whether the wife assisted in the construction. I believe, however, that such a bower lasts for several seasons.

"*The Amblyornis* selects a flat, even place around the trunk of a small tree, about as thick and as high as a medium-sized walking-stick. It begins by constructing at the base of the tree a kind of cone, chiefly of moss, of the size of a man's hand. The trunk of the tree becomes the central pillar, and the whole building is supported by it. On the top of the central pillar twigs are then methodically placed in a radiating manner resting on the ground,

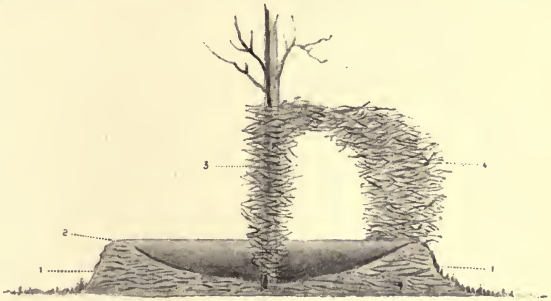
leaving an aperture for the entrance; thus is obtained a conical and very regular hut. When the work is complete many other branches are placed transversely in various ways, so as to make the whole quite firm and impermeable to wet. A circular gallery is left between the walls and the central cone, the whole bower being about three feet in diameter. All the stems used by the *Amblyornis* are the thin stems of an orchid (*Dendrobium*), an epiphyte forming large tufts on the mossy branches of great trees, easily bent like straw, and generally about twenty inches long. The stalks had the leaves, which are small and straight, still fresh and living on them, which leads me to the conclusion that this plant was selected by the bird to prevent rotting and mould in the building, since it keeps alive for a long time, as is so often the case with epiphytical orchids.

"The refined sense of the bird is not satisfied with building a hut. It is wonderful to find that it has the same ideas as a man; that is to say, that what pleases the one gratifies the other. The passion for flowers and gardens is a sign of good taste and refinement. I discovered, however, that the inhabitants of Mount Arfak did not follow the example of the *Amblyornis*, for their houses were quite inaccessible from dirt.

"*The Garden.*—Now let me describe the garden of the *Amblyornis*. Before the cottage there is a meadow of moss; this is brought to the spot and kept free from grass, stones, or anything which would offend the eye. On this green turf flowers and fruit of bright colours are placed so as to form a pretty little garden. The greater part of the decoration is collected round the entrance to the arbour; and it would appear that the husband offers there his daily gifts to his wife. The objects are very various, but always of a vivid colour. There were some fruits of a *Garcinia*, like a small-sized apple; others were the fruits of *Gardenias* of a deep yellow colour in the interior. I saw also small

rosy fruits, probably of a scitamineous plant, and beautiful rosy flowers of a splendid new *Vaccinium*, now known as *Agapetes amblyornithidis*. There were also fungi and mottled insects placed on the turf. As soon as the objects are faded, they are moved to the back of the hut."

The range of the Gardener Bower-bird extends from the Arfak Mountain in North-western New Guinea along the ranges which form the backbone of that great island, to Mount Victoria in the Owen Stanley mountains in south-



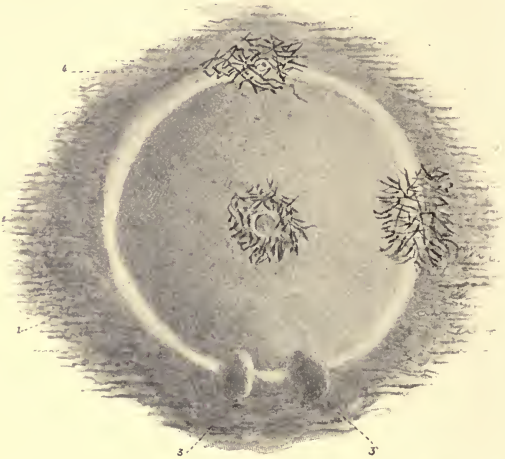
SECTION.

1. Formation of twigs.
2. Moss.
3. Centre pole, with structure of twigs.
4. Bower

(From a sketch by Sir William McGregor, published in the Queensland Blue Book for 1892.)

eastern New Guinea. In the Astrolabe Range of the latter chain is found a second species of Gardener-bird, known as *Amblyornis subalaris*. It is orange-crested like the Arfak species, and has a similarly dull-coloured female. Sir William McGregor, the Governor of British New Guinea, discovered the bower of this bird, which seems to be quite as wonderful a structure as that of the other Gardener-bird. He describes it as follows—"This bower is built of twigs arranged in the shape of a shallow basin, about three feet in diameter, the side being some six inches higher than the centre. The whole of the basin is

covered with a carpet of the greenest and most delicate moss, which, as it is of a different kind from that growing around on the ground or trees in the vicinity, led me to a conjecture that it had been planted by the bird itself. The surface is scrupulously cleared of all leaves, twigs, etc. In the centre of the basin a small tree, without branches,



GROUND PLAN.

1. Centre pole.
2. Bower.
3. Entrance.
4. Twigs, beans, and beetles.

(From a sketch by Sir William McGregor, published in the Queensland Blue Book for 1892.)

and about two inches in diameter, is growing. Immediately around this tree, and supported by it to the height of about two feet, is erected a slight structure of small sticks and twigs, placed horizontally, and crossing one another. On the extreme outer edge of the basin a more substantial collection of twigs had been built up, which was arched above, so as to join the collection around the centre pole,

leaving a clear space beneath for the bird to pass through in his gambols. The basin has two entrances leading into it. They are four or five inches apart, and are formed by a depression or gap in the outer rim. The bower is placed immediately to the right of the entrances, and opposite to the latter, on the highest part of the raised rim of the basin, is collected a quantity of black sticks (four inches or so in length), black beans, and the black wing-coverings of large *Coleoptera*. Black is evidently the most attractive colour to this bird."

It will have been noticed that a thorough gradation in style of architecture is afforded by the Bower-birds, from the simpler structures of the Satin-bird, whose favourite decorations are bleached bones and shells, with only an occasional bright Parrot's feather, to the more carefully built arbours of the Spotted Bower-birds (*Chlamydodera*), and thence to the elaborate playing-grounds of the Gardener-birds, with their tent-like huts, their meadows and floral decorations. I believe that many of the *Paradiseidæ*, such as the Golden Birds of Paradise (*Xanthomelus*), the Superb Birds of Paradise (*Lophorhina*), and the Six-plumed Birds of Paradise (*Parotia*) will ultimately be found to make bowers, and have regular playing-grounds.

CHAPTER VI

THE NESTING OF BIRDS

The Orders and Families of Birds, with their mode of nesting—General remarks thereon—Guillemots and their eggs.

The Common Cuckoo (*Cuculus canorus*).

THE building of nests is almost entirely confined to the members of the Class *Aves*, but is not so exclusively, as many other animals construct nests, such as the Stickleback amongst Fish, the Harvest Mouse amongst the Mammals, while resting-places or nests, as they are called, are not unknown among the higher Apes, such as the Orangs and Chimpanzees. Further instances could of course be adduced, but in the construction of nests birds stand unrivalled for skill. It may be useful to pass rapidly in review the Orders and Families of existing Birds, and to note the peculiarity of their nesting habits, as follows—

SUB-CLASS RATITÆ.

Nest on the ground, a shallow pit. Incubation performed by the male bird only.

SUB-CLASS CARINATÆ.

Order TINAMIFORMES. (Tinamous.) Nest, a scantily-lined hole in the ground. Eggs wonderfully glossy, and of a green, blue, purple, or brown colour. Incubation performed by the male.

Order GALLIFORMES. (Game-birds.)

Sub-Order MEGAPODII. (Megapodes or Mound-builders.) No nest. Eggs placed in a mound and left to hatch out by themselves. Australasia.

Sub-Order CRACES. (Curassows.) Nest in a tree. Two white eggs. South America.

Sub-Order PHASIANI. (Pheasants and Partridges.) Nest, a roughly-lined depression in the ground. Eggs numerous, uniform, or pitted and scrawled with black, occasionally white. Cosmopolitan. Incubation by the female.

Sub-Order HEMIPODII. (Hemipodes or Bustard-Quails.) No nest. Eggs laid in a depression in the ground. Incubation by the male. Southern Europe, Africa, and India.

Sub-Order PTEROCLETES. (Sand-Grouse.) No nest. Eggs three, equally rounded at both ends, and double-spotted. India, Africa, Central Asia to Southern Europe.

Order COLUMBIFORMES. (Pigeons.) Nest, a rude platform of sticks on a branch, rarely in a cave or hole. Eggs two, pure white. Cosmopolitan.

Order OPISTHOCOMIFORMES. (Hoatzins.) Nest of sticks in a bush over water. Eggs four, buff, with spots and blotches of reddish-brown, like those of Rails. Northern South America, Amazonia, Guiana, etc.

Order RALLIFORMES. (Rails.) Nest of sedge in reeds or by the side of water. Eggs five to ten in number, stone-colour or creamy buff, with brown spots and grey underlying dots. Cosmopolitan.

Order PODICIPEDIDIFORMES. (Grebes.) Nest of reeds floating on the water. Eggs white, from three to five in number. Cosmopolitan.

Order COLYMBIFORMES. (Divers.) No nest. Eggs two, dark

olive-brown or clay-brown with indistinct black spots and grey underlying ones; laid on the ground close to the water. Northern Europe and Asia to North America.

Order SPHENISCIFORMES. (Penguins.) Nest, a rough structure of grass on a rock or in a burrow. Eggs two, white. Southern Seas.

Order PROCELLARIIFORMES. (Petrels.) Nest, none, or a coarse one of grass. Only one egg, white, generally laid in a hole or under a rock. Cosmopolitan.

Order ALCIFORMES. (Auks.) Nest, none. One or two eggs laid in cleft of rock or burrow, or on the bare shelf of a cliff. Northern Seas.

Order LARIFORMES. (Gulls.) A roughly-constructed nest on a rock or in a marsh, occasionally in a tree. Eggs, two or three in number, double-spotted, usually clay-brown with black markings. Cosmopolitan.

Order CHARADRIIFORMES.

Sub-Order ATTAGIDES. (Seed-Snipes.) Nest on the ground, with scanty lining of grass. Eggs stone-colour, with brown markings. South America.

Sub-Order CHIONIDES. (Sheath-bills.) Nest in holes or under rocks. Eggs buffy-white, with numerous purple blotches. Southern Seas.

Sub-Order DROMADES. (Crab-Plovers.) Nest, none. One white egg, laid at the end of a long tunnel in the sandy shores of the Indian Ocean.

Sub-Order CURSORII. (Coursers.) Nest, a hollow in the ground. Eggs two, double-spotted, buff, covered with numerous blackish scribblings. Deserts of Africa and India.

Sub-Order GLAREOLÆ. (Pratincoles.) Nest and eggs as in the Coursers, but the egg so densely scribbled over as to hide the ground-colour. South Europe, Africa, India, Australia.

Sub-Order PARRÆ. (Jacanas.) Nest of weeds and grass, floating in the water. Eggs pear-shaped, numerous, uniform olive-brown or scrawled with black lines. Africa, India, Australia, South America.

Sub-Order CHARADRII. (Plovers and Snipes.) Nest, usually none, or a slightly-lined depression in the grass. Eggs four, pear-shaped, laid point to point, double-spotted, clay-coloured, more or less marked with black spots or lines. Cosmopolitan.

Sub-Order ŒDICNEMI. (Stone-Plovers or Thick-knees.) Nest none. Eggs two, stone-colour, spotted or lined with black. Entire Old World. South America.

Sub-Order OTIDES. (Bustards.) Nest none, or a scantily-lined depression in the ground. Eggs two to four, double-spotted, olive with a little shading of brown or grey spots. Africa, Southern and Central Europe, to Central Asia, India.

Order GRUIFORMES.

Sub-Order GRUES. (Cranes.) Nest on the ground in a marsh. Eggs two or three, double-spotted, brown with obscure reddish or grey spots. Cosmopolitan. (Absent in South America.)

Sub-Order ARAMI. (Limpkins.) Nest of rushes in a marsh. Eggs numerous, double-spotted, white with pale brown and purple spots. Southern United States to South America.

Sub-Order RHINOCHETIDES. (Kagus.) Nest unknown. Eggs reddish-buff, marked with brown and grey. New Caledonia.

Sub-Order MESITIDES. (Madagascar Kagus.) Nest and eggs unknown. Madagascar.

Sub-Order EURYPYGÆ. (Sun-Bitterns.) Nest of sticks in trees. Eggs two, greyish with rufous spots. South America.

Sub-Order PSOPHIÆ. (Trumpeters.) Nest on the ground. Eggs white. South America.

Sub-Order DICHOLOPHI. (Seriamas.) Nest in a low bush. Eggs two, white with rufous spots. South America.

Order ARDEIFORMES. (Herons, Storks, and Ibises.)

Sub-Order ARDEÆ. (Herons.) Nest of sticks in a tree or reed-bed. Eggs three to nine in number, blue or white. Cosmopolitan.

Sub-Order Ciconii. (Storks.) Nest of sticks in a tree or reed-bed. Eggs three to five in number, white.

Sub-Order Balænicipitides. (Shoe-bills.) Nest in reeds, made of sedges. Eggs chalky-white or bluish-white. N.E. Africa.

Sub-Order Scopi. (Hammer-heads.) Nest of sticks, very large, with separate chambers. Eggs three to five, white. Africa.

Sub-Order Plataleæ. (Spoonbills and Ibises.) Nest of sticks in reeds or on trees. Eggs blue or bluish-green, or white, spotted with reddish-brown. Cosmopolitan.

Order Phœnicopteriformes. (Flamingoes.) Nest of mud. A single, chalky-white egg. South Europe, Africa, India, America.

Order Anseriformes. (Swimming-Birds.)

Sub-Order Anseres. (Swans, Geese, and Ducks.) Nest, a depression in the ground, lined with down from the bird's breast, or a large nest of moss or sticks and rushes. Eggs numerous, from six to twelve, uniform olive, greenish or white. Cosmopolitan.

Sub-Order Palamedeæ. (Screamers.) Nest of rushes, in a marsh. Eggs six, white. South America.

Order Pelecaniformes. (Pelican-like Birds.)

Sub-Order Phaëthontes. (Tropic-birds.) No nest. One egg only, laid in the hole of a rock, white, with mottlings of reddish-brown. Tropical Seas.

Sub-Order Sulæ. (Gannets.) Nest of grass or sea-weed on a rock. One egg only, white with a chalky covering. Cosmopolitan.

Sub-Order Phalacrocoraces. (Cormorants and Darters.) Nest of sticks or sea-weed in a rock, or in reed-beds or trees. Eggs two to four in number, bluish or green with a chalky covering. Cosmopolitan.

Sub-Order Pelecani. (Pelicans.) Nest of sticks or rushes, in trees or on the ground. Only one egg, white with a chalky covering. Temperate and Tropical regions of both Hemispheres.

Sub-Order FREGATI. (Frigate-Birds) Nest of sticks on rocks, trees, or bushes. Only one white egg. Tropical Seas.

Order CATHARTIDIFORMES. (American Vultures.) Nest on rock or on the ground. Egg white, or with a few spots. North and South America.

Order ACCIPITRIFORMES. (Birds of Prey.)

Sub-Order SERPENTARII. (Secretary-Birds.) Nest of sticks in bush or tree. Eggs two, white, with rusty brown smudges. Africa.

Sub-Order ACCIPITRES. (Vultures, Hawks, Eagles, etc.) Nest of sticks, on rocks or trees, or on the ground in marshes. Eggs variously coloured, from plain white to the richest rufous. Cosmopolitan.

Sub-Order PANDIONES. (Ospreys.) Nest large, of sticks, on trees or ruins. Eggs three or four, richly coloured, mostly rufous. Cosmopolitan.

Order STRIGES. (Owls.) Nest, none, in hole of tree or ground, or that of some other bird in a tree. Eggs from four to nine, white. Cosmopolitan.

Order PSITTACIFORMES. (Parrots.) Nest, none, in hole of tree. Eggs two to four, white.

Order CORACIIFORMES. (Picarian Birds.)

Sub-Order STEATORNITHES. (Oil-birds.) Nest, a hard mud-like structure, in a cave. Eggs four, white. South America.

Sub-Order PODARGI. (Frog-mouths.) Nest of sticks etc., in a tree. Eggs two, white. Australasia and Indo-Malayan Region.

Sub-Order LEPTOSOMATI. (Kirombos.) Nest of rushes in the hole of a tree. Egg white. Madagascar.

Sub-Order CORACIÆ. (Rollers.) Nest of a few grasses in the hole of a tree. Eggs four to five, white. Old World; generally distributed.

Sub-Order HALCYONES. (Kingfishers.) Nest, none; or a rough heap of fish-bones at the end of a tunnel excavated by the birds themselves; sometimes in ant-hills, or in holes of trees. Eggs from four to seven, white. Cosmopolitan.

Sub-Order BUCEROTES. (Hornbills.) Nest, none. Eggs two or three in number, white, laid in hole of tree, in which the female is imprisoned. Africa, India, Indo-Malayan Region.

Sub-Order UPUPÆ. (Hoopoes.) Nest, none, or scantily lined with a little grass, in a hole. Eggs from five to seven, light olive-brown, bluish, or greenish-white. Europe and Asia, Africa.

Sub-Order MEROPES. (Bee-Eaters.) Nest, none. Eggs three to seven, white, laid in a chamber at the end of a long tunnel hollowed by the birds themselves. South Europe to Central Asia, Africa, India, Australasian Region.

Sub-Order MOMOTI. (Motmots.) Nest, none. Eggs four, laid in a chamber at the end of a tunnel hollowed out by the birds themselves. South America.

Sub-Order TODI. (Todies.) Nest, none. Eggs four, white, laid in a chamber at the end of a tunnel made by the birds themselves. West India Islands.

Sub-Order CAPRIMULGI. (Nightjars.) Nest, none. Eggs generally two, white, mottled with lines and scribblings, laid on the ground. Cosmopolitan.

Sub-Order CYPSELI. (Swifts.) Nest of various construction, cemented by the birds' own saliva. A rough structure of rubbish under a roof, or an elaborate pendent nest, or cup-shaped, and attached to the wall of a cave. Eggs one to four in number, white. Cosmopolitan.

Sub-Order TROCHILI. (Humming-birds.) Nest generally of moss, cup-shaped, on a branch of a tree. Eggs two, white. Chiefly South American; a few migrating to North America in the summer.

Sub-Order COLII. (Colies, or Mouse-birds.) Nest cup-shaped, of sticks, in a bush. Eggs three, white. Africa.

Order TROGONES. (Trogons.) Nest, none. Eggs two to four in number, white, laid in hole of tree. Africa, India, Indo-Malayan Region.

Order COCCYGES. (Cuckoo-like Birds.)

Sub-Order MUSOPHAGI. (Plantain-eaters.) Nest of sticks, in a bush. Eggs three in number, greenish or bluish-white. Africa.

Sub-Order CUCULI. (Cuckoos.) Nest, none, or a rough one of sticks in a tree or a domed structure on the ground. Many species parasitic. Cosmopolitan.

Order SCANSORES. (Climbing Birds.)

Sub-Order RHAMPHASTIDES. (Toucans.) Nest, none. Eggs white, two in number, laid in hole of tree. South America.

Sub-Order CAPITONES. (Barbets.) Nest, none. Eggs from three to five, laid in hole of tree or bank. Africa, India, Indo-Malayan countries, South America.

Sub-Order INDICATORES. (Honey-Guides.) Nest, none. Eggs white, said to be laid in the nest of Barbets or some other birds. Africa, Himalayas, Mountains of Malayan Peninsula and Borneo.

Order PICIFORMES. (Picine Birds.)

Sub-Order PICI. (Woodpeckers.) Nest, none. Eggs glossy white, varying in number according to the genus, from one to ten, laid on chips of wood at the bottom of a hole, or in ant-hills or even wasps' nests. Cosmopolitan.

Sub-Order BUCCONES. (Puff-birds.) Nest, none. Eggs two, glossy white, laid in hole of bank. South America.

Sub-Order GALBULÆ. (Jacamars.) Nest, none. Eggs four, glossy white, laid in hole of bank. South America.

Order EURYLÆMI. (Broad-bills.) Nest, pendent from end of bough, of large size, of grass and leaves. Eggs white or salmon-buff, thickly spotted with dull reddish-brown or black. India, Indo-Malayan Region.

Order MENURÆ. (Lyre-birds.) Nest, a large oven-shaped structure of sticks and moss. Only one egg, of a purplish-grey colour, with spots of darker purplish-brown. Australia.

Order PASSERIFORMES. (Perching Birds.)

Section A. Oscines.

FAMILY I. *Corvidæ.* (Crows.) Nest of sticks and grass in a

tree or hole. Eggs white or bluish-green, with black spots and markings. Cosmopolitan.

Fam. II. *Paradiseidæ*. (Birds of Paradise.) Nest of sticks in a tree. Eggs Crow-like, but the ground-colour pinkish-buff. Australian region.

Fam. III. *Ptilonorhynchidæ*. (Bower-birds.) Nest of sticks in a tree. Eggs greenish or purplish-white, much scribbled over with black. Australian region.

Fam. IV. *Sturnidæ*. (True Starlings.) Nest of straw and sticks in a hole. Eggs bluish or white. Europe, Asia, and Africa.

Fam. V. *Eulabetidæ*. (Tree-Starlings.) Nest a slight structure of grass in the hole of a tree or building. Eggs greenish-blue with purplish spots. Africa, India, Australia.

Fam. VI. *Eurycerotidæ*. (Blue-bills.) Nest and eggs unknown. Madagascar.

Fam. VII. *Dicruridæ*. (Drongos.) Nest of fine twigs and grasses in the fork of a bough, like a cradle. Eggs white, or salmon-colour with brownish-red spots. Africa, India, Australian Region.

Fam. VIII. *Oriolidæ*. (Orioles.) Nest of grass and strips of bark suspended in the fork of a bough like a cradle. Eggs white, spotted with reddish-brown. Old World generally.

Fam. IX. *Icteridæ*. (Hang-nests.) Nest often very large, pendulous, of grasses and leaves, in trees, tussocks of grass, in reeds, or on the ground. Eggs bluish or white, written over and spotted with black and grey. Some species parasitic. North and South America.

Fam. X. *Ploceidæ*. (Weaver-birds.) Nest, a bag made of strips of palm-leaves and grass, strongly interwoven by the birds, suspended from boughs of trees or built in bushes near the ground. Eggs white, grey, or purplish, with greenish or brown spots. Africa, India, Indo-Malayan Region.

Fam. XI. *Tanagridæ*. (Tanagers.) Nest in various situations, cup-shaped, of grass stems or lichens, in trees or bushes, sometimes domed, or in grass in marshes. Eggs white,

bluish, or greenish, with spots and blotches of brown. North and South America.

Fam. XII. *Cærebidæ*. (American Creepers.) Nest, domed, of hair and spiders'-webs, between twigs. Eggs white or greenish-blue, with red or brown spots. South America.

Fam. XIII. *Fringillidæ*. (Finches.) Nest of varying form, of twigs, lined with feathers and often decorated with moss and lichens, in every kind of situation. Eggs various, generally bluish or white, with black or purplish spots and lines. Cosmopolitan.

Fam. XIV. *Alaudidæ*. (Larks.) Nest on the ground. Eggs dark brown or white, mottled with brown. Cosmopolitan.

Fam. XV. *Motacillidæ*. (Wagtails and Pipits.) Nest on the ground, or in a bank or wall. Eggs white or grey, with more or less pronounced spots of brown, or purplish-brown, with darker markings. Cosmopolitan.

Fam. XVI. *Mniotiltidæ*. (American Warblers.) Nest, cup-shaped, of moss, hair, spider-webs, etc. Eggs cream-coloured, with reddish-brown and grey spots, or lined with black. North or South America.

Fam. XVII. *Certhiidæ*. (Creepers.) Nest of twigs with grass and moss, wool, etc., in holes, behind crevices of bark, etc. Eggs white, with reddish, rarely blackish, spots. Nearly Cosmopolitan (except South America).

Fam. XVIII. *Meliphagidæ*. (Honey-suckers.) Nest of twigs or roots, in grass or in bushes or trees. Eggs buff or salmon-coloured, with spots and lines of reddish-brown. Australian Region.

Fam. XIX. *Nectariniidæ*. (Sun-birds.) Nest, purse-like, of grass and rootlets, with a projecting dome over the entrance. Eggs greenish or greyish, with purplish or reddish spots, or white with blackish streaks or spots. African, Indian and Australian Regions.

Fam. XX. *Drepanidæ*. (Hawaian Honey-suckers.) Nest of roots and leaves. Eggs not yet described. Hawaian Archipelago.

Fam. XXI. *Dicæidæ*. (Flower-peckers.) Nest, purse-like and

domed, or of roots and grass in a hole. Eggs white, or reddish, with brown spots. African, Indian and Australian Regions.

Fam. XXII. *Zosteropidæ.* (White-Eyes.) Nest, cup-shaped, deep, of grass and moss, on a thin branch. Eggs pale blue. African, Indian and Australian Regions, to China and Japan.

Fam. XXIII. *Paridæ.* (Tits.) Nest large, and, as a rule, amply lined with feathers, in the hole of a tree or building; in some genera purse-shaped. Eggs numerous, white, or white spotted with reddish-brown. Nearly Cosmopolitan (except Australia and South America).

Fam. XXIV. *Sittidæ.* (Nuthatches.) Nest, a rough mass of grasses, wool, etc., in the hole of a tree, generally plastered up by the birds themselves. Eggs five to eight, white, with spots of reddish-brown. Europe and North America, India, China, Indo-Malayan countries, Australia.

Fam. XXV. *Regulidæ.* (Gold-crests.) Nest of moss suspended under a bough. Eggs numerous, five to ten, buffy-white, with occasionally a few reddish spots. Europe, Northern Asia, North and Central America.

Fam. XXVI. *Laniidæ.* (Shrikes.) Nest of sticks, grass, stems, lined with wool, bulky in size, usually in thorn-trees or bushes. Eggs greyish or greenish-white, with grey or blackish spots and marblings. Cosmopolitan.

Fam. XXVII. *Artamidæ.* (Swallow-Shrikes.) Nest a shallow saucer of twigs and grasses in a tree. Eggs white or greenish, spotted with purple and reddish-brown, with lighter grey spots. India, Indo-Malayan Region, Australia.

Fam. XXVIII. *Ampelidæ.* (Wax-wings.) Nest flat, of twigs and grass. Eggs bluish or grey, with spots of grey or dark brown. Northern Europe and Asia. North and Central America.

Fam. XXIX. *Vireonidæ.* (Greenlets.) Nest, a deep cup of leaves, grass, and mosses, in a forked twig. Eggs white, spotted with black or brown round the large end. North and South America.

Fam. XXX. *Sylviidæ.* (Warblers.) Nest of various form, of

grass, bents, etc. Eggs of various colours, plain or spotted or marbled. Old World generally.

Fam. XXXI. *Turdidæ*. (Thrushes.) Nest of various materials, cup-shaped, in trees or holes. Eggs various, plain blue, or bluish with red and brown markings. Cosmopolitan.

Fam. XXXII. *Cinclidæ*. (Dippers.) Nest domed, of moss, under a rock or roots of a tree. Eggs white. Europe, Northern Asia and the Himalayas, Mountains of North and Central America and the Andes.

Fam. XXXIII. *Troglodytidæ*. (Wrens.) Nest domed and rounded, with an opening on the side, made of moss and lined with feathers, in a hole of tree or building, or against stems or trellis-work; in some species suspended in reeds. Eggs white, or white slightly speckled with reddish and grey. Europe, Northern Asia, and Himalayas, North and South America.

Fam. XXXIV. *Mimidæ*. (Mocking-birds.) Nest of twigs or rootlets, in bushes and trees. Eggs plain, bluish-green, or green speckled with rufous. North and South America.

Fam. XXXV. *Timeliidæ*. (Babbling-Thrushes.) Nest various, a rough domed nest of leaves and grass on the ground, or cup-shaped of moss, etc. Eggs uniform greenish-blue or creamy-buff or olive, with spots and blotches of reddish-brown, olive and grey. Africa, India, Indo-Malayan Region, Australia.

Fam. XXXVI. *Pycnonotidæ*. (Bulbuls.) Nest of twigs, grass, and moss, built in trees and bushes. Eggs white, or greenish-white, or pinkish, spotted with purple or brown. Africa, India, Indo-Malayan Region.

Fam. XXXVII. *Campophagidæ*. (Cuckoo-Shrikes.) Nest a shallow cup, of roots or grass and felted with vegetable fibres and moss or lichens. Eggs white or greenish-white, with brown or purplish spots and markings. Africa, India, Indo-Malayan Region, Australia.

Fam. XXXVIII. *Muscicapidæ*. (Fly-catchers.) Nest a rough structure of grass or moss in a hole or on the ground, or in the bark of a tree; sometimes a beautiful little cup of moss

on a bough. Eggs white, spotted with brown or rufous. Entire Old World.

FAM. XXXIX. *Hirundinidæ.* (Swallows.) Nest of mud and straw under eaves or in a barn; retort-shaped and made of clay; or a scanty nest of grass in hole of bank or tree. Eggs white, or white with reddish spots. Cosmopolitan.

Section B. Oligomyodæ.

FAM. I. *Tyrannidæ.* (Tyrant-birds.) Nest of various form and material, of grass or moss, open or domed, suspended from boughs, or in holes, etc. Eggs salmon-colour, with red or brown spots, uniform bluish-green or scribbled over with reddish-brown or purple. North and South America.

FAM. II. *Oxyrhamphidæ.* (Sharp-bills.) Nest and eggs unknown. South America.

FAM. III. *Pipridæ.* (Manakins.) Nest of grass, hair, leaves, etc., suspended from low bush. Eggs two, yellowish-white, with reddish or brown blotches. South America.

FAM. IV. *Cotingidæ.* (Chatterers.) Nest various, of sticks or grass in holes or in trees, or of mud and sticks in caves. Eggs of different colours, greenish-blue or brown, with reddish spots, white, etc. South America.

FAM. V. *Phytotomidæ.* (Plant-cutters.) Nest of twigs and grass-fibre in bushes. Eggs bluish-green, marked with brown. South America.

FAM. VI. *Philepittidæ.* (Wattled Ant-Thrushes.) Nest and eggs unknown. Madagascar.

FAM. VII. *Pittidæ.* (Ant-Thrushes.) Nest globular or oven-shaped, of rough grass and leaves on the ground, or in a bush near the latter. Eggs white, with markings of reddish or purple, four or five in number. Africa, India, and China, Indo-Malayan Region, Australia.

FAM. VIII. *Xeniscidæ.* (New Zealand Wrens.) Nest domed, of moss, among roots, or in hole of tree, or bottle-shaped in hole of tree or building. Eggs white, or white with red spots. New Zealand.

Section C. Tracheophonæ.

FAM. I. *Dendrocolaptidæ.* (Wood-hewers.) Nest of various form, of mud or sticks and other material, often of very large size on a branch, with passages; sometimes suspended from a branch, or domed in a reed-bed. Eggs white, buff, or greenish-blue. South America.

FAM. II. *Formicariidæ.* (Ant-birds.) Nest of roots or fibres and moss in low bushes. Eggs bluish or white or rufous brown, streaked or spotted with reddish-brown. South America.

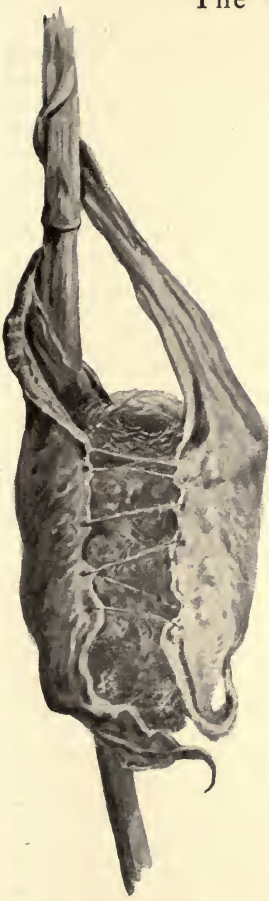
FAM. III. *Conopophagidæ.* (Ant-Wrens.) Nest and eggs unknown. South America.

FAM. IV. *Pteroptochidæ.* (Tapacolas.) Nest of grass or moss in holes in the ground, or of sticks or grass in low bushes. Eggs white. South America.

Section D. Atrichornithidæ. (Scrub-birds.) Nest and eggs unknown. Australia.

Such a summary of the Families and Orders of Birds as I have given above comprises but a rough and general idea of the characteristics of their nests and eggs, but sufficiently for the purpose of our present study. A survey of the different styles of colouration in the eggs of birds, even those belonging to the same family, will soon convince the student that, for the purpose of classification, the pattern or colour of the eggs will not carry him far. Thus, for instance, in the Family *Hirundinidæ*, or Swallows, the general type of egg is white with reddish spots, whereas in the Martins the egg is pure white; but even in the case of the latter birds there is difference in the mode of nidification between the mud-built nest of a House-Martin (*Chelidon urbica*) under the eaves of a house, and the rough little apology for a nest which the Sand-Martin (*Clivicola riparia*) makes at the end of its tunnel. And this rule of variation runs throughout many Families which in other respects would seem to be so well characterized that uniformity in

the colour of the eggs might have been expected. Thus in many Families the variation in the form and position of the nests and in the colour of the egg is extreme. The Crows (*Corvidæ*) mostly build a nest in the open, but the Jackdaws (*Colœus*) build their nests in holes. In the Birds of Paradise and the Bower-birds the eggs are characteristic and the nest does not vary in structure, and the same may be said of the typical Starlings, the Tree-Starlings, the Drongos, and the Orioles. In the Hang-nests (*Icteridæ*), however, we meet with purse-like nests in the typical genera, while in some of the ground-living species the nest is placed on the ground, and the Cow-birds (*Molothrus*) are parasitic and make no nest of their own. Weaver-birds (*Ploceidæ*) may be said to have a typical form of nest, though it is placed in a variety of situations, but in the Tanagers again great variation in the nesting-site takes place, nor is there absolute uniformity in this respect in the Finches. Larks, Wagtails, and Pipits are mostly ground-nesters, and the colour of their eggs is characteristic, and a certain type of nest and eggs is kept up throughout the American Warblers, Creepers, Honey-suckers, Sun-birds, and Flower-peckers, as well as the White-eyes, and the majority of the Tits; but in the latter family we find the aberrant nests of the Long-tailed Tits (*Ægithalus*) and the Penduline Tits (*Remiza*). Nuthatches seem to have much the same nesting habits wherever they are found, and the same may be said of Gold-crests, Shrikes, Swallow-Shrikes, Wax-wings, and Greenlets; but when we come to the Warblers and Thrushes there is great variation in the form and position of the nest, as well as in the colour of the eggs. Here, however, arises the question as to whether all the birds which we associate with the *Sylviidæ* and *Turdidæ* really belong to those Families. Uniformity in nesting habits is the rule among the Wrens and Mocking-birds, but in the Babbling-Thrushes (*Timeliidæ*) great variation in this respect obtains, though here again the



Nest of the Tailor-bird (*Sutoria sutoria*), (three-quarters natural size), from a specimen in the British Museum, procured by Mr. E. W. Oates in Pegu.

limits of the family *Timeliidæ* are somewhat arbitrary, and many forms, such as the Tailor-birds (*Sutoria*) now included within its borders, may prove to belong to other Families, when a more intimate acquaintance with their structure and anatomy is attainable.

Bulbuls and Cuckoo-Shrikes are all much alike in their ways of nesting and in the type of eggs they lay, while of the Swallows I have already spoken. In the aberrant Passeres of the New World the nesting is characteristic in some of the Families, but any amount of difference in nesting-habits is met with among the Wood-hewers (*Dendrocolaptidæ*) and, though in a less degree, among the Tyrant-birds (*Tyrannidæ*).

Certain large groups of birds, however, lay characteristic eggs and vary little in their method of nesting. This is especially the case with what are called Picine or Woodpecker-like Birds (*Piciformes*) and Picarian Birds (*Coraciiformes*). Nearly all of these discard a nest, but lay their glossy white eggs in the holes of trees or banks,

depositing them on the bare floor of a chamber at the end of a tunnel which they excavate themselves, or laying them on the chips of wood which result from the hewing of the hole which they bore in a tree-trunk or branch. Woodpeckers especially adopt this mode of nesting, as do their cousins the Barbets (*Capitones*), and one reason for the placing of the eggs in concealment has often been suggested, viz. that the latter being white and very conspicuous, would fall an easy prey to some prowling bird or lizard, if they were placed in an open nest and exposed to view. Of the truth of this surmise there can be no doubt, and that the majority of birds which lay white eggs are at pains to conceal them is an evident fact, but certain exceptions will doubtless occur to the mind of the reader, as, for instance, in the case of the Nightjars (*Caprimulgi*), which are always considered to be truly Picarian Birds, and which ought, therefore, to lay white eggs in a hole of a tree, but do not do so. On the contrary, they lay two eggs on the ground, and these are not white, but are marbled with grey, so they are not easy to discover. Pigeons, too, lay white eggs in an open nest, and these must be plainly visible from above, while, on the other hand, Tits, Creepers, and Nuthatches, which usually lay spotted eggs, conceal them with as much care as if they were white ones, in the hole of a wall or in a bag-shaped nest like that of the Long-tailed Tit (*Ægithalus vagans*) or the Wren (*Anorthura troglodytes*).

The most variable egg in the world is probably that of the Common Cuckoo (*Cuculus canorus*), as it is also probably the smallest in proportion to the size of the bird, but for this there is apparently good reason, for among all the members of the Class *Aves*, there is no more wonderful bird than our Cuckoo, which is more fully noticed under the heading of the Parasitic Birds (p. 295). But while our well-known species places its egg in the nest of

other birds and leaves them to hatch it out and bring up the young Cuckoo, there are other members of the Sub-Order *Cuculi* which build their own nests, rear their own young, and make most affectionate parents.

Humming-birds lay white eggs, but their cup-shaped nest, though built in an exposed place, is generally made so as to assimilate with its surroundings, as is often done by our Common Flycatcher (*Muscicapa grisola*), and other birds. The remarkable mud-like nest of the Guacharo (*Steatornis*) is alluded to below (p. 189); it is one of the most wonderful of all nests, and is not unlike that of the Flamingo in appearance. Some Swifts, as has been seen, make most extraordinary nests, such as could hardly be supposed to be the work of members of the same Sub-Order of Birds, for the majority of them have no artistic tastes at all, and construct the roughest of nests of materials which they procure on the wing, agglutinated together by the saliva of the birds themselves. On the other hand, a wonderful hanging nest is sometimes made and attached to a rock, while the Tree-Swifts (*Macrodipteryx*) are apparently responsible for the smallest nest constructed by any bird in proportion to its size.

Owls always lay white eggs, and mostly nest in the hole of a tree, but not invariably, as one day-flying species at least, viz. the Snowy-owl (*Nyctea nyctea*), makes its nest in the open. Among the Birds of Prey the greatest difference exists in the colour of the eggs, which range from nearly white to the most richly-marked and beautiful eggs of any known birds. Throughout the Herons, Ducks, and Geese, an evident type of egg prevails, that of the former being plain blue or white, and that of the latter being buff, olive, or whitish, without any spots, but in the Flamingoes, as well as in the Pelicans, Cormorants, and Gannets, the egg has a peculiar chalky covering, which has to be removed before the real colour of the egg can be seen. This is a

feature not entirely confined to these birds, as the Guira Cuckoo of South America lays a blue egg which is almost entirely hidden by the chalk which overlays it. Some Storks also have a chalky egg. With regard to the appearance of the eggs of the Geese and Ducks there is much sameness, and the principal peculiarity connected with their breeding habits is the lining of the nest with down from the body of the female bird; and so characteristic is this down, that, in the majority of cases, the eggs of the different species of Ducks can be determined by the colour of the down which lines the nest.

In the descriptions of the eggs given above in my short review of the Families of Birds, it will be noticed that I occasionally speak of some of them as "double-spotted." This is one of the most important features in the study of Oology, and relates to the prominence of the underlying spots and markings (generally grey or purplish), which, in those eggs wherein they are a feature, are sometimes as much in evidence as the overlying or darker markings of the shell. Thus, for instance, on the strength of the eggs alone, one can separate the Herons from the Cranes, though in olden times they were always classified together, for the former birds lay an unspotted blue or whitish egg, whereas in the Cranes the egg is always dark and "double-spotted." In most of the *Passeriformes* or Perching-birds it will be also noticed that where the eggs are spotted the markings are of this two-fold nature.

Plovers and Snipes lay characteristic eggs, and in nearly every case the latter are pear-shaped, four in number, and are placed point to point, and in this group of birds Oology is of great service in classification, as the eggs laid by the Crab-Plovers, Coursers, Pratincoles, Jacanas, Plovers, and Bustards are of such a different type from those of the true Plovers, that it would be impossible on this account alone to place them in the same Sub-Order,

although we know from their general anatomy that they are all members of one great Order. Of the remaining Orders of Birds, it may be said that the eggs are for the most part characteristic, and that those of Grebes, Divers, Penguins, Petrels and Gulls are easily recognizable. Those or Pigeons and Rails are also highly characterized, but among the Game-birds there is considerable variation, some laying white or buff-coloured eggs with scarcely any markings, while in the Quails the eggs are much scribbled over and lined with black.

No egg varies more in colour than that of the Common Guillemot (*Uria troile*), which lays its single pear-shaped egg on the ledge of a rock. Scarcely two Guillemot's eggs are exactly alike, and the difference in the type of colour and markings is truly remarkable. Thus the ground-colour varies from white to creamy-buff, bluish or green, or even rufous-buff, while the spots and blotches are either evanescent, or may almost cover the shell, so that it is impossible to give an exact diagnosis of the egg of the Guillemot. Tinamous likewise lay a wonderful egg, not only as regards colour, which may be apple-green, or purple, or grey, but on account of the extraordinary varnish or gloss which distinguishes their eggs from those of all other birds, and renders them quite unmistakable.

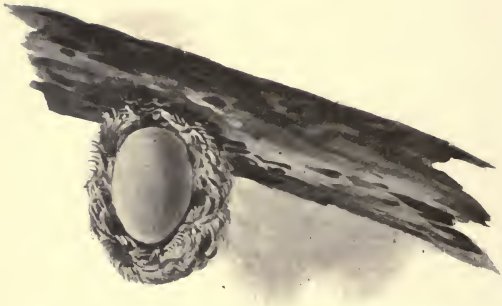
In reviewing the peculiarities of nests and eggs enumerated in the foregoing summary of the Class *Aves*, it is necessary to note that many birds make no nests at all, and that these belong to many different Families, so that, although the Picarian Birds and Woodpeckers lay their eggs in concealment, there are other birds, like the Guillemots and Razorbills, which lay their eggs in the open, but yet make no attempt at a nest. The Auks have already been alluded to as a remarkable family of Birds, and they may be said to play, in the Arctic Regions, the *rôle* which the Penguins carry out in Antarctic waters.

Yet even with the Auks there is not uniformity in their mode of nesting, for if the Guillemots and Razorbills are content to lay their egg on the shelf of a bare cliff, the Puffins resort to a burrow, and the Black Guillemot (*Uria grylle*) to a cleft or fissure in a rock. The latter species is a very interesting bird to any one who visits the North Sea in the spring. Far out to sea he may meet with the Common Guillemot (*Uria troile*) and the Puffin (*Fratercula arctica*), so far out, in fact, that it is scarcely possible that the birds so encountered can be members of the communities at that time nesting on the cliffs of Flamborough or in the Lofoten Islands, but must be stray birds who have no intention of nesting that year. As the coast of Norway is approached, however, the Black Guillemot puts in an appearance, flying in pairs or in small parties in the fjords or among the rocky islands off the coast, and laying its eggs in fissures of the cliffs by no means easy of access. And yet the egg of this bird is not pure white, but has black spots and grey underlying markings. Many places where the Black Guillemot breeds were shown to me in May of the present year (1898), but their homes were yet untenanted, and it was only in June that a nesting-place was discovered for me by Bernhard Hanson, my young Norwegian assistant, under circumstances which might have ended the writing of this book for good and all. The boy left me the task of holding the boat close to the foot of a sheer cliff, up which he climbed till he came to the cleft into which he had tracked the Guillemot, and with the aid of my walking-stick he succeeded in dragging the female bird off her egg, and then stood suspended on a ledge with the flapping bird in his hand, drawing blood with every peck of her vicious bill. Nothing remained for the boy but to jump into the boat, which I had moved on to a shelving rock covered, as it turned out to be, with large and sharp-pointed limpets. Having placed the

Guillemot in a bag, we started to row to the other side of the fjord, distant about a mile, but we had not proceeded far before I found that the water was mounting gradually over my boots, and a further examination showed that my young companion's leap had forced a hole through a plank in the bottom of the boat into which the water bubbled faster than we could bale it out. There was nothing left for it but to pull for our lives, and though we reached the mainland in safety, I fear that the fisherman from whom we hired the boat must have found her sunk at her moorings that same evening. After keeping the Guillemot in a box for two days, I found that I had the steamer almost to myself on my return journey to England, and so I was able to turn the poor bird loose in one of the bathrooms for the whole of the voyage home. It must quite have made up its mind that it would never float in sea-water again, for on being released from its box, it went through the most curious antics in the bath, swimming first on one side and then on the other, with its pretty crimson feet out of the water, and the diving and splashing which it indulged in were amusing to witness. I got the bird in safety to the Zoological Gardens, but it died a few days after for no apparent cause, except that the change from sea-water to fresh may have had a prejudicial effect upon it.

CHAPTER VII

WONDERFUL NESTS



Nest of *Macrodipteryx comatus*, seen from above, from a specimen in the British Museum (natural size).

Birds which make no nest—The breeding of the Hornbills—Hoopoes—Wood-Hoopoes and Cobras—Kingfishers—Mud-nest builders—Hoatzins—Flamingoes—Swallows and Martins—Oven-bird—Cemented nests—Edible Swiftlets—Crested Swifts.

OF the birds which make no nest, perhaps the Hornbills are the most interesting. Here we find the female resorting to the hole of a tree and laying her eggs, one or two in number, while the male plasters the hole up and takes upon his shoulders the support of his wife and child. Anything more fraught with disastrous consequences to the family can scarcely be imagined, for if the poor hard-

working husband is shot or otherwise killed the imprisoned wife and baby run considerable risks of starvation. There would seem, however, to be a spirit of co-operation among Hornbills, for even if the female cannot free herself from the hole in which she is confined, as the natives assert she can do on occasion, she may be sure of the assistance of her relations. Thus Mr. John Whitehead relates[1] that he once found a nest of a Hornbill in Northern Borneo, wherein the old hen-bird and her youngster were imprisoned in an old tree, the entrance to the hole being secured by a plaster of gums and resins. He found no less than five other Hornbills feeding her, both males and females being engaged in the task. These were doubtless birds which had brought up their own young one, and were free to attend to some one else's needs. Before he discovered the nest Mr. Whitehead shot three of the birds, but the next day he again found a pair of Hornbills bringing food to the imprisoned female. The latter, on being taken out of the tree, was so weak that she was unable to use her wings for a long time, and it may be a wise provision of nature that the hen-bird should be imprisoned in this curious manner, for it seems from specimens of the Pied Hornbill (*Lophoceros melanoleucus*) which we have in the British Museum from South Africa, that the female undergoes a complete moult when she is in the tree, and thus, if the nidification were otherwise effected, the bird would be at the time powerless for flight, and unable to defend herself. It appears also that her imprisonment is quite voluntary, as the female assists the male in the work of plastering up the entrance to the cavity in the tree in which she seeks refuge, and that the walling-up of the wife at this defenceless time of her life, is to guard her against the attacks of the insidious foes which, in the shape of skunks or lizards, would intrude upon her retirement. In

[1] 'Ibis,' 1890, p. 17.

Borneo, as my friend Mr. Hose tells us, a *Parodoxure* (*Hemigale*) is a dangerous enemy, and Monitors and Tree-Lizards also attack the home of the Hornbill, but the female bird is generally equal to the occasion, and her sharp bill is a sufficiently formidable weapon of defence.

As to the conveyance of food by the male to the female, a remarkable circumstance has been brought to light, viz. that the fruit brought by the former is packed in a kind of

An Enemy.

envelope or bag, which consists of the epithelial lining of the gizzard of the male bird. This phenomenon has been well described by Professor Newton in his 'Dictionary of Birds' (p. 437). Alluding to the imprisonment of the female, he says—"This remarkable habit, almost simultaneously noticed by Dr. Mason in Burma, Tickell in India, and Livingstone in Africa, but since confirmed by other observers, especially by Dr. Wallace in the Malay Archipelago, has been connected by Mr. Bartlett[1] with a

[1] 'Proceedings of the Zoological Society for 1869,' p. 142.

peculiarity as remarkable, which he was the first to notice. This is the fact that Hornbills, at intervals of time, whether periodical or irregular is not yet known, cast the epithelial lining of their gizzard, that layer being formed by a secretion derived from the gland of the proventriculus or some other part of the alimentary canal. The epithelium is ejected in the form of a sack or bag, the mouth of which is closely folded, and is filled with the fruit that the bird has been eating. The announcement of a circumstance so extraordinary naturally caused some hesitation in its acceptance, but the essential truth of Mr. Bartlett's observations has been abundantly confirmed by Sir William Flower (*t. c.* p. 150), and especially by Dr. Murie ('Proceedings Zoological Society, 1874,' p. 420), and what seems now to be most wanted is to know whether these castings are really intended to form the hen-bird's food during her confinement." Of this, in my own mind, there can be little doubt, but Mr. Hose says that he has also found in the stomach of a Hornbill the "gum-like substance" with which the plastering in of the female is effected, so that between providing the material for the effectual imprisonment of his wife, and shredding the lining of his gizzard for her future sustenance, to say nothing of that of the baby, the male Hornbill must have rather a bad time of it. No wonder then that Livingstone says that "the prisoner becomes quite fat, and is esteemed a dainty morsel by the natives; while the poor slave of a husband gets so lean that on the sudden lowering of the temperature, which often happens after a fall of rain, he is benumbed, falls down, and dies." The plumpness of the female must ensue after the moult is completed inside the tree, for in the specimen of *Lophoceros melanoleucus* sent to the British Museum by Mr. Schönland from South Africa, the hen-bird is a very scraggy individual, and must offer an uninviting meal even to a Kaffir. It is somewhat remarkable that the curious mode

of nesting indulged in by the Hornbills was only made known in recent years, but it must have been known to the natives in every country, and I myself had a confirmation of the habit in the narrative of a native gentleman on the West Coast of Africa. My friend, the late Mr. Herbert Ussher, C.M.G., when Governor of the Gold Coast, took great interest in the natural history of the colony over which he presided, and in the soil of which he now lies buried. His principal assistant in the collecting of birds was a native, who worked for the British Museum after Governor Ussher's death, until small-pox carried him off. This old gentleman—he told me in one of his letters that he was a "gentleman," and that he wished to be addressed in full—"Mr. St. Thomas David Aubinn, Esq., Royal Hunter to the King of Denkera"—was a wonderful collector, and sent me many interesting birds, accompanied by not less interesting bills. The latter would sometimes arrive to the tune of £60 or £70, when the specimens were not worth more than £6 or £7, and on receiving the latter sum he always professed himself deeply grateful. I was so much struck with the commercial intelligence displayed by my correspondent that I considered his overcharges as the result of the development of the negro shrewdness, educated under the protection of the *Pax Britannica*, and I asked him to send me a few particulars of the habits of the birds which he met with in Ashantee (then closed to us, as it was before

"I bring you fine thing this morning, sah. Rarety from Denkera."

the time of our wars in that country), and the forests of the interior. One day there arrived a case of birds, each specimen done up in a paper wrapper, but beyond the fact that a bird was "common" or "rare," there was nothing particular to attract one's interest, till two packages were opened, containing a mother Hornbill and her baby. To these the following account of their habits was attached—"When the female go to sit, the male he her shut in tree. If he no bring food, then she angry. If he no then bring food, then she more angry—swear. If he no then bring food, then she curse him for die—Man beef, beefy, beef." All the above is perfectly intelligible except the last sentence. Does it mean to represent the cry of the imprisoned female? Scarcely this, for the note of a Hornbill is quite different; or is it old Aubinn's imagination that in her distress the lady speaks English, before she proceeds to finish off her husband and "curse him for die"? The portrait of "Mr. St. Thomas David Aubinn, Esq." is copied from a sketch drawn for me by my friend, Governor Ussher, and it is here reproduced. Since Mr. Ussher's work in the early seventies, no one has explored our colony on the Gold Coast in pursuit of its natural history, and the good work done by the "Royal Hunter to the King of Denkera" has not been amplified.

A Baby Hornbill.

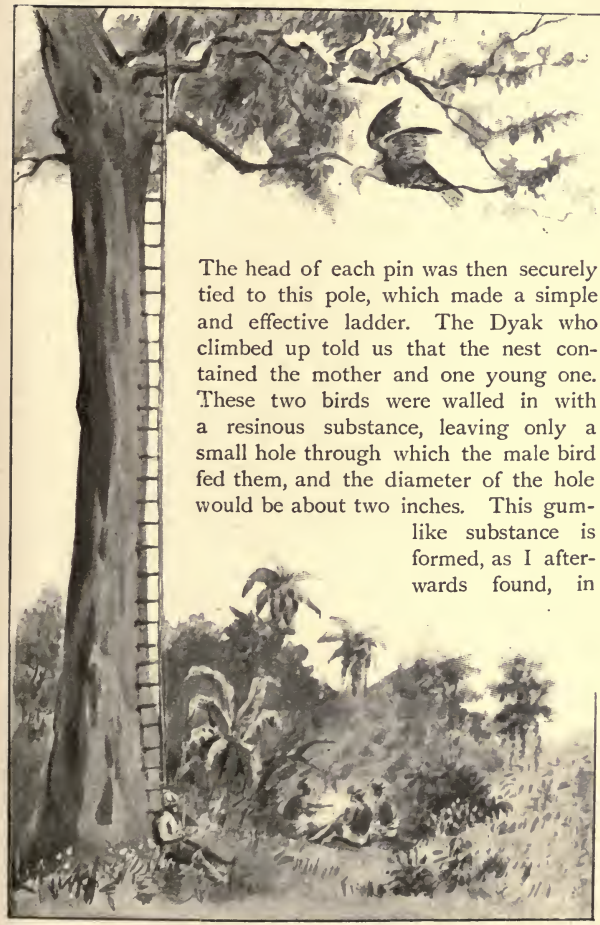
In the British Museum we have still the interesting specimen of a baby Hornbill obtained by Dr. A. R. Wallace in Sumatra. It is entirely bare of feathers, but as first brought in by the natives, it is described by him as a most curious object, without a particle of plumage on any part of it. "It was exceedingly plump and soft," he says, "and

with a semi-transparent skin, so that it resembled more a bag of jelly, with head and feet stuck on, than a real bird."

Mr. Charles Hose has supplied me with the following account of the taking of a mother Hornbill and her young one in Sarawak, and the accompanying illustrations are from sketches[1] made by him of the incident in question. His account is especially interesting as confirming the previous reports that the community in general watch over the interests of their imprisoned relations, and combine to render assistance to the captives when the male bread-winner has been shot. Thus he writes from Baram, the province in Sarawak, of which he is the Resident officer—

"During my visit to Mount Dulit in October 1891 I had the good fortune to find the nest of a Hornbill (*Rhytidoceros subruficollis*), and I have much pleasure in handing you my notes of observations made of the habits of this bird. Our attention was first attracted to a quantity of excrement at the base of a large tree, and looking to see where it came from, we discovered a hole in the tree, about fifty feet from the ground. One of my Dyak hunters at once recognized it as the nest of a Hornbill, and proceeded to climb the tree, but was obliged to come down before reaching the nest, as the tree had no low branches to help him. He soon, however, overcame the difficulty in a manner creditable to his ingenuity. Having cut a number of pins or pegs of very hard wood, he drove them into the tree at intervals of about three feet, each pin being about an inch in diameter, and nine inches long. After the first few pins had been driven in, a straight pole was cut about thirty feet long, and one end was driven firmly into the ground in a perpendicular position, at the foot of the tree.

[1] These sketches have been published in the 'Idler' for June 1894, illustrating my article on 'Some Humours of Bird-life.'



The head of each pin was then securely tied to this pole, which made a simple and effective ladder. The Dyak who climbed up told us that the nest contained the mother and one young one. These two birds were walled in with a resinous substance, leaving only a small hole through which the male bird fed them, and the diameter of the hole would be about two inches. This gum-like substance is formed, as I afterwards found, in

Storming the Stronghold of the Hornbill.

the body of the bird, and deposited by it round the entrance to the nest, where it hardens, and becomes a protection against the many enemies of these birds. When the young bird is old enough to fly, the parents break down this wall, and the hen and her youngster leave the nest. Wishing to observe the habits of these interesting Hornbills, I would not allow the men to take the birds, or to interfere with the nest; and on coming to the tree some days afterwards, I watched the male bird feeding his family. He settled on a convenient knob of the tree just below the nest, and the hen-bird put her beak through the hole and received four or five pellets about the size of a small hen's egg, but longer. These pellets, I afterwards discovered, were enveloped in a sort of elastic skin, and contained chopped-up leaves and small shoots, mixed with fruits and various seeds. When the young bird was ready for us to take, we went to open the hole, and one of the men having gone on before, shot the male bird and proceeded to climb the ladder and break away the wall at the entrance to the nest. The tree, however, was hollow, and the hen-bird fluttered upwards out of his reach. Finding he could not catch her, he left the young one in the nest to prevent the mother from leaving, as he had made the hole by this time quite large enough for her to escape; he then came down, and we returned to the hut to devise a plan for securing the old bird. The Dyak, who had done this work before, soon made a kind of

Dyak Basket.

basket by splitting up the end of a bamboo for about a foot in several strips, and then tying a ring inside to keep them open in a cup-shape.

"We then returned to the tree, and to our surprise found several more Hornbills, some feeding the birds in the hole, and others flying round, and constantly settling near the spot. Whilst we were watching these birds we saw a small Paradoxure (*Hemigale hardwickii*) coming along a branch of the tree in the direction of the nest. At once it occurred

Hardwicke's Paradoxure.

to me that the wall of gummy substance was made for a protection against attacks of such animals as this. The men wanted to shoot it, but I was curious to see what it would do. Presently the Paradoxure came to the hole, and the hen-bird inside darted a sharp blow at it with her beak, narrowly missing the beast's head. The animal then turned back and ran along the branch, whence a shot from my gun brought it to the ground. The Dyak then went up the tree by his ladder, and quickly captured the hen-bird in his ingenious basket, without injuring her; and we

brought her home with her young one, which made an extraordinary monotonous noise, and appeared to be continually hungry, though seeming to be well-fed. The nestling afterwards became quite tame, and lived for months, flying about my garden; sometimes taking possession of the back of a chair whilst I was at meals, when he would catch pieces of bread thrown to him. He was very partial to butter, and would clear the table of any that was on it, if one left the room. He afterwards became great friends with an Orang-utan (*Simia satyrus*) which I had tame in the garden, but he had a way of pinching the monkey with his beak which I have no doubt was painful. The Orang, however, would always share his food with the Hornbill, and they never seemed to disagree. When older, the bird used to repeatedly utter the cry, *Ku-ku, ku-ku, kua,* which is the name given to it by the Dyaks."

The Hornbills belong, as we have already seen, to the group of Picarian Birds, which not only make no nest, but for the most part excavate a tunnel in the ground, at the end of which their white eggs are deposited, or they place the latter in the hole of a tree. Thus do Parrots, Kingfishers, Barbets, and Woodpeckers, together with the other allied forms, but the Hornbills are alone in their curious habit of boxing the hen bird up during the time of incubation. Strangely enough, however, the Hoopoes, which bear no great outward resemblance to the Hornbills, as may be seen by our figure of the Common Hoopoe (*Upupa epops*) on p. 281, have somewhat the same peculiarity in nesting, viz. that the female seldom leaves the nest, and is supported entirely by the male. Different as the Hoopoes are in looks from the Hornbills, the two families possess several peculiar anatomical features in common. The Common Hoopoe chooses a hole in which to place its young, generally in a tree, but it may be in the fissure of

Wood-Hoopoes (*Irrisor erythrorhynchus*) and Cobra.

a rock or wall. The female is said to fly out for a few moments during the day, but makes no attempt at feeding herself, and is waited on entirely by the male bird, who is indefatigable in bringing her a supply of food while she is sitting on the eggs. While the true Hoopoes (*Upupa*) are mostly found in desert countries, to the colour of which surroundings their sandy plumage assimilates, the Wood-Hoopoes (*Irrisoridæ*) are forest-birds, peculiar to Africa. They likewise lay white eggs in the hole of a tree, and their nest, like that of the Common Hoopoe (which in China will sometimes choose an exposed coffin as its nesting-place), is a strong-smelling domicile, while the birds themselves emit a disagreeable odour. My old friend, Jules Verreaux, who lived in South Africa and made collections there for many years, told me an episode in the life of the Wood-Hoopoes, which he himself witnessed. The birds have a very harsh cackling note, whence the Dutch colonists dub them "Kachela" or "Chatterer," and he was on one occasion attracted by their well-known note, uttered as if the birds were in distress. On approaching the spot he perceived three of these birds, one perched on the back of the other, and cackling incessantly. He then saw that below the birds was an erect Cobra with expanded hood, and apparently motionless but for the quivering of its tongue. Gradually the cries of the birds became fainter and fainter, and just as he was in the act of shooting the snake, the lowest of the three dropped off its perch into the mouth of the Cobra, which was shot by the narrator on the same instant. The other birds flew away, but the one which had been seized by the snake was quite dead when he reached the spot, whether killed by fear or by the same shot which destroyed the reptile, he did not know.

Kingfishers sometimes choose curious places for their nests, and these are often found at a great distance from

water. I have known of a nest of the Common Kingfisher (*Alcedo ispida*) in the hollow of a tree in a garden in the town of Maidenhead, at least half a mile from the Thames, while on another occasion I visited the nesting hole of one of these birds high up in Quarry Wood near Marlow. Here the Kingfisher had taken advantage of a fallen tree, which in its descent had torn away and exposed a sandy bank. Into this the bird had tunneled, the entrance-hole being concealed by one of the exposed roots, and the tunnel proceeded in an irregular course over roots, and under roots, till the chamber with its seven white eggs was reached. We essayed first to get at the nest by digging down from above, and quite five minutes had elapsed before I suddenly saw the hen bird come waddling up the tunnel, and before I could prevent her, she flew off through the wood to the river, her beautiful blue black glittering in the midst of the spring greenery of the trees, and certainly one of the sights least expected in the middle of a wood. What labour it would have been for the parents to catch fish for the youngsters in the river below and bear every one in their bills to the nest on the hill above!

The White-breasted Kingfisher (*Halcyon smyrnensis*) has been known in India to make its nest in the hole of a well at least one hundred feet below the surface of the ground, and several kinds are known to utilize ant-hills and form their tunnels in the latter. Such a nesting-place is here illustrated from a photograph taken by Mr. Dudley Le Souef in the Cape York Peninsula of North-eastern Australia. The bird which made the tunnel on this occasion is the Long-tailed Kingfisher of Australia, *Tanysiptera sylvia*, which is a beautiful species with two central tail-feathers gracefully elongated and crossed. These Racket-tailed Kingfishers of the genus *Tanysiptera* are peculiar to the Molucca Islands, New Guinea, and the Cape York Peninsula of North-eastern Australia, and they

Nest of *Tanysiptera sylvia*. (From a photograph by Mr. D. Le Souef.)

belong to the insect-eating, forest-loving section of the family, their food consisting principally of insects, and never of fish like our own *Alcedo ispida*. Indeed their long tails would be greatly in their way if they attempted to imitate a true Kingfisher and plunge into the water, as the latter is accustomed to do.

The eggs of another species, the Ruddy Kingfisher (*Halcyon coromandus*), were sent to the British Museum by Sir Hugh Low, from North-west Borneo. This bird is said to place its eggs in the pendulous nest of a peculiarly vicious bee, and he states that the nest can only be robbed after destroying the bees. In the case of the five eggs sent by him his hunters unluckily set fire to the whole nest, and burnt it up.

Woodpeckers sometimes burrow into ants' nests for their nest. Mr. J. Gammie states that on four occasions he has taken the eggs of the Rufous Woodpecker (*Micropternus phæoceps*), near Darjiling, and each time in an ants' nest. He writes—"One of these nests was suspended from a bamboo growing in dense jungle at about 2000 feet; the other three were hanging from small trees growing in the narrow strips of jungle left uncut along the sides of nullahs in cultivated places. They were all within six to ten feet of the ground. These ants' nests, which are of a globular shape, somewhat resembling the nest built by one of the European wasps (*Vespa britannica*, I think), are exceedingly common in Sikhim up to 3500 feet, and uncommonly comfortable-looking breeding-quarters they make. Whether the presence of the Woodpecker causes the ants to desert their nest, or whether the birds take possession of deserted nests only, I am at present unable to say. Certainly they are most inveterate enemies of this particular species of ant, and appear to feed almost exclusively on it. Those I have dissected had their stomachs crammed with them. The bird has a peculiar

persistent smell about it, which may either be caused by its particular diet, or it may arise from a secretion provided by nature to protect it from being bitten by the ants, and to force them to vacate their nest when the bird comes to take possession. The first nest I found contained but one egg, probably laid that morning, and the ants were swarming about it and running up and down the bamboo to which it was suspended. Not unlikely, they were moving to other quarters. About the other three nests there was not a single ant, but they had evidently long been appropriated by the intruders, and the original owners had had time to flit. The nests were all in an excellent state of preservation, and did not have the appearance of having been long deserted by the ants. The Woodpeckers had excavated their entrances in the side, and had hollowed out a cup-shaped cavity for their eggs in the middle." On the specimens sent to him by Mr. Gammie, Mr. Hume remarks—"The nest of this species is one of the most remarkable that I have ever seen. From the end of a Mango-branch ants of some species had constructed a huge, nearly globular, nest, about thirteen inches long and eleven in diameter, involving, as those nests commonly do, all the leaves and twigs springing from that part of the branch. The nest is a greyish-brown mass, of a half felt-like, papier-maché-like substance. Into this the Woodpecker has bored a circular entrance about two inches in diameter, and inside it he has scooped out a circular cavity, some five inches in diameter." The ants seem to suffer greatly from the attacks of Woodpeckers in the tropical forests, and I have seen a specimen of a big *Thriponax* from Burma, in which the tail of the bird was covered with the heads of ants, which had viciously attacked the bird and had not relaxed their hold even in death, though the motion of the bird's tail against the tree had sent their bodies flying.

Just as the Hoatzin was referred to as a survivor of

The Guacharo, or Oil-bird (*Steatornis caripensis*).

ancient bird-life, so does another type of bird in South America appear to be entirely separated from any near ally. This is the Guacharo, or Oil-bird (*Steatornis cariepensis*), a curious creature which from its appearance and the texture of its plumage would be taken for a sort of Nightjar. Like the latter birds it is crepuscular and comes out to feed at night, and there the semblance ends. The accompanying figure shows the nest of the

The Nest of the Guacharo.

Guacharo, and this, it will be seen, is a hard structure in shape resembling a cheese, and not unlike, as I said before, the nest of a Flamingo. The Guacharo, strictly a bird of the night, breeds only in the darkest caves both on the sea-coast and inland, and it is principally known as an inhabitant of the island of Trinidad, whence the British Museum has received most of its specimens. To procure the nest, my friend, the late Dr. Bevan Rake, had to approach the caves in a boat from the sea, and he not only sent me specimens of the mud-built nest, but some of the young

birds as well, and, more curious still, a collection of fruit-stones with which the floor of the cave was strewn. These should be, according to the observations made by Dr. Stolzmann in Peru, the stones of a species of *Nectandra*, which are rejected by the bird after the fleshy portion of the fruit has been devoured, and the last-named naturalist says that the fruit is seized by the birds when in full flight from the ends of the slender boughs on which it grows. In some places the Indians illuminate the cave with torches fixed to long poles, and then the nests can be seen at a height of fifty or sixty feet up, in funnel-like holes at the top of enormous grottoes, the roof of which is pierced like a sieve. When scared, the birds fly round and round the cave, or hide in the recesses of the rocks, whence they call to each other with plaintive cries. In the darkness little else can be heard than the calls of the birds and the fluttering of their wings, and Stolzmann says that sixty shots fired at random into the roof of the cave only brought down eleven birds. The young bird sent me by Dr. Bevan Rake from the caves of Trinidad was such a mass of yellow oily fat, that it was some little time before I could find where the bird itself was concealed. Hence arises the popular name of "Oil" bird for the Guacharo, and the Indians make special expeditions to the caves and capture numbers of the young, building their huts of palm-leaves near the entrance of the cave, and melting down the fat of the nestlings in clay pots. The "oil season," as it is called, takes place about midsummer, and the fat is known as "Guacharo butter."

Stolzmann says that the young are fed on *Nectandra* fruits, and the stones are thrown up by the nestlings without any apparent effort on their part, the ejection of the stone being signalized by a slight movement of the feathers of the throat, when the mouth is gently opened, and the stone appears. If any of the flesh of the fruit still adheres

to it the bird picks it off. The old birds throw up the stones when flying, and the number of fruits which they swallow is remarkable, as Stolzmann, whose account of the species has been quoted here, states that he has shot birds in the evening with their crops quite empty, and within half-an-hour afterwards he has shot specimens with seven and eleven fruits in their crops.

The Flamingoes (*Phœnicopterus*) are birds which also build mud nests, but in the open mud-flats. They are found both in the Old and New Worlds, and in Miocene times were inhabitants of Northern Europe, some short-legged members of the group, known as *Elornis*, having actually inhabited France and the south of England at that remote period. The commonly received notion that the Flamingo built a nest of mud and that the female bird sat straddle-legged across the mound has lately been dispelled by more accurate observation, and the actual method of incubation of the bird, as shown by the accompanying figure, is drawn from the group in the Natural History Museum. The nest here figured was procured in Southern Spain, and was presented to the National Collection by the late Lord Lilford. It is to a well-known English field naturalist, Mr. Abel Chapman, that we are indebted for an account of the actual nesting habits of the Flamingo in the marshes of Southern Spain, where the birds are seen in flocks of from three hundred to five hundred individuals. Similar flocks are also a feature of the Nile Valley in winter, and at the same season of the year Flamingoes collect in herds of tens of thousands in the lake regions of the province of Sind in North-western India. A flock of these birds is always a beautiful sight, and when they rise on the wing, the effect of the white and rose-colour of their bodies is wonderful. As they fly, Flamingoes keep their long necks and legs outstretched, and they travel like Geese in regular bands of V-shaped form. They moreover

resemble Geese in the "gaggling" note, and their food also consists of grass and other plants. The nestling of the Flamingo is covered with whitish down, and there is no indication in its little straight bill of the peculiar form which the latter organ will assume as the bird proceeds to maturity. The young take to the water at once, and are expert swimmers almost from the moment when they emerge from the egg. The latter is greenish-blue, but this colour is entirely concealed by a thick chalky coating, which has to be removed before the proper tint can be observed. The old birds are excellent swimmers and seem to delight in standing in water up to their "knees," and this partiality for water makes their mode of nesting a still greater matter of surprise. We will let Mr. Chapman tell the story of his discovery in his own words—

"One cannot go far into the 'marisma' without seeing that extraordinary fowl, the Flamingo, certainly the most characteristic bird of the wilderness. In herds of from three to five hundred in number, several of which are often in sight at once, they stand feeding in the open water, all their heads under, greedily tearing up the grasses and water-plants from the bottom. On approaching them, which can only be done with extreme caution, their silence is first broken by the sentries, who commence walking away with low croaks; then the whole five hundred necks rise at once to the full extent, every bird gaggling his loudest as they walk obliquely away, looking back over their shoulders as though to take stock of the extent of the danger. Pushing a few yards forward, up they all rise, and a more beautiful sight cannot be imagined than the simultaneous spreading of their thousand crimson wings, flashing against the sky like a gleam of rosy light.

"On examining narrowly the different herds, there was an obvious dissimilarity in the appearance of certain groups; one or two in particular seemed so much denser than the

Nest of the Flamingo.

others; the narrow white line appeared at least three times as thick, and the centre looked as if the birds were literally piled upon each other. My man, Felipe, suggested that these birds must be at their 'pajarera,' or breeding-place; and after a long ride through rather deep water, we found that this was so. On our approach, the cause of the peculiar appearance of the herd from a distance became clearly discernible. Many of the birds were sitting down on a low mud island; some were standing on it, and others, again, were in the water. Thus the different elevations of their bodies formed what had appeared a triple or quadruple line.

"On reaching the spot, we found a perfect mass of nests; the low mud plateau was crowded with them as thickly as the space permitted. These nests had little or no height: some were raised two or three inches, a few might be five or six inches; but the majority were merely circular bulwarks of mud, with the impression of the bird's legs distinctly marked on it. The general aspect of the plateau was not unlike a large table covered with plates. In the centre was a deep hole full of muddy water, which, from the gouged appearance of its sides, appeared to be used as a reservoir for nest-making materials.

"Scattered all round this main colony were numerous single nests, rising out of the water, and evidently built up from the bottom. Here and there two or three or more of these were joined together—'semi-detached,' so to speak; these separate nests rose some six or eight inches above the water-level, and were about fifteen inches across. The water was about twelve or fifteen inches deep. None of these nests as yet contained eggs; and though I returned to the 'pajarera' on the latest day I was in the neighbourhood (May 11), they still remained empty. On both occasions many hundreds of Flamingoes were sitting on the nests, and on the 11th we had a good view of them at

close quarters. Linked arm and arm with Felipe, and crouching low on the water, to look as little human as possible, we approached within some seventy yards before their sentries showed signs of alarm, and at that distance, with the glass, I observed the sitting birds as distinctly as one need wish. Their long red legs doubled under their bodies, the knees projecting as far as or beyond the tail, and their graceful necks neatly curled away among their back-feathers, like a sitting Swan, with their heads resting on their breasts—all these points were unmistakable. Indeed, it is hardly necessary to point out that in the great majority of cases (the nest being hardly raised above the level of the flat mud) no other position was possible."

It was not till May 25 that Mr. Chapman obtained any eggs from this colony of Flamingoes, and he points out that the delay in the period of incubation indulged in by the species is the more curious, as it results in the gradual drying up of the water, so that the nests would be left stranded in a scorching sea of sun-baked mud.

Another group of mud-builders is encountered among the Swallows (*Hirundinidæ*), for although our common Chimney-Swallow (*Hirundo rustica*) places its nest on a ledge or beam for support, while other species tunnel into banks, the House-Martin (*Chelidon urbica*) builds, under the eaves of houses, a nest entirely composed of mud-nodules, and lined with feathers. This is the little bird one sees in the country and in the suburbs of our large towns, descending to the puddles in the roads, after the latter have been watered, and collecting little pellets of sand and mud for its nest. When thus engaged it is easily distinguished from the other birds of the neighbourhood by its blue back, and by the conspicuous white band across the lower part of the latter. It is a remarkable fact that this common little species, which is everywhere protected, and must therefore rear millions of young birds in Europe every summer, still

keeps us in ignorance of its winter home. That it must winter somewhere in Africa can scarcely be doubted, but the only authentic instance of its capture in that continent which has come under my notice, rests on a single specimen in the British Museum obtained in the Northern Transvaal. We may yet find that the winter habitat of the Martin is in the vast regions of the Central Soudan.

Where encouraged, this little bird becomes very tame and familiar, and I remember a visit I once paid to a well-known lover of the species, Colonel Russell. His house at Stubbers, near Romford, was simply hung with Martins' nests, while a Dove-cot in the neighbouring farm-yard had rows on rows of nests, attached to each other in clusters. My old friend nailed laths to the side of his house, whereon he put a little mud to encourage the birds to commence operations, while clay was regularly brought from a distance of half-a-mile and deposited near a pond, so that the Martins could always depend upon a supply of proper material wherewith to build or repair their nests. So tame were they, that on the clay being moistened with water by their protector, some of the birds would come down to our feet and make off with some nodules. A supply of Ducks' feathers was also kept in a bag, and at a whistle from the Colonel, the birds would fly down at once and seize the feathers in the air, close to our faces, as we sent the plumes floating from a high loft towards the ground. Another peculiarity also possessed by the Colonel was an intense hatred for the common Sparrow, and *Passer domesticus* was never allowed to chirp within sound of the old house at Stubbers, if he knew it, while it seemed to me that his estimate of his tenants' intelligence was grounded on their discouragement of Sparrows and encouragement of Martins. Certain it is that the Sparrow is a deadly enemy to all Swallows from its usurpation of the nests of the latter, which are so much

better built than its own, and I remember my disappointment in India, when on one of the staircases of Akbar's palace at Futtehpur Sikri, I discovered to my delight the curious retort-shaped mud-nest of one of the Red-rumped

Nests of the Indian Fairy-Martin (*Petrochelidon fluvicola*).

Swallows (*Hirundo erythropygia*), only to find that the interior had been appropriated by the ever-ubiquitous Sparrow in the shape of his smaller and cleaner representative, *Passer indicus*. These mud-nests of the Red-rumped Swallows and the Fairy Martins (*Petrochelidon*) are remark-

able for the long neck which the birds attach to them, and they are often found in large numbers clustered together on a rock. In India a colony of the Indian Cliff-Swallow, as it is popularly called (*Petrochelidon fluvicola*), has been known to construct six hundred nests, and large gatherings are also seen in the allied Australian species (*P. ariel*), as well as in the South African Cliff-Swallow (*P. spilodera*) and the North American species (*P. pyrrhonota*). The nests are attached to the side of a cliff or building, and have also been found on the side of a large barn in North America. Gould says that in the case of the Australian Cliff-Swallow or Fairy Martin the nest is constructed by several birds working together, one remaining inside the nest and receiving the pellets as they are brought by its companions. The spouts are often eight or nine inches in length, and are not always built in the same direction, but take different angles.

The nests of the Edible Swiftlets (*Collocalia*) are also most curious structures. With these nests a large trade is done with China, from many of the Malayan Islands, over three and a half million nests having been known to be exported in a single year from Borneo to the latter country, where birds'-nest soup is considered a delicacy. In Borneo and other places the caves in which the Swiftlets build are leased to the collectors for a considerable sum, but it is only the white nests, made of the pure secretion derived from the salivary glands of the birds, which are of any real value. The nests of those species which mix into their nests grass or feathers are not appreciated as an article of commerce. Quantities of guano are also found in some of the caves, formed by the *débris* from the nests, the bodies of young birds which have perished, and the droppings of hundreds of occupants, which form together a loathsome mass of putrid water, reaching, in a cave visited by Colonel Legge

in Ceylon, to a depth of thirty feet. Mr. Harry Pryer found that in one of the great caves of Northern Borneo a pole thrust into the guano to a distance of eighteen feet did not reach the bottom, and there was over the floor an average accumulation varying from five to fifteen feet, so

Nests of Edible Swiftlets, from Bornean specimens in the Natural History Museum, presented by Mr. Charles Hose.

that it is evident that the caves inhabited by the Swiftlets must have been tenanted by these birds for a very long period. The glands which supply the secretion from which the nest is principally composed, were found by the late Dr. Bernstein to be situated, like two pads, at the side of the tongue. These glands only become enlarged at the

period of nest-building, and the secretion is described by him as a thick, adhesive slime, like unto gum-arabic. By using a little stick it is possible to draw this slime out in threads, and the whole supply can be extracted by twisting the stick round and round.

Oven-bird (*Furnarius rufus*), and its nest (from specimens in the British Museum).

Of all the builders of mud-nests, however, there is probably none more wonderful than the Oven-bird (*Furnarius rufus*), especially as it belongs to the South American family *Dendrocolaptidæ* or Wood-Hewers, most of which are climbing-birds with stiffened tails like that of our own Creeper (*Certhia familiaris*). As among the

Woodpeckers there are some forms which have soft and rounded tail-feathers like the Wrynecks (*Iynx*), instead of the stiffened and pointed rectrices which are the usual characteristics of the Family, so among the Wood-hewers or Spine-tailed *Dendrocolaptidæ* of South America, there are many species which do not hew wood or have spiny tails. Of these the Oven-bird is one, and the nest which it builds is a very curious structure of mud, placed on the branch of a tree, on the cornice or beam of a house, or even on the roof of the latter. Mr. W. H. Hudson, who passed the best part of his life in the Argentine Republic, has many stories to relate of the Oven-builder, a favourite bird among the natives of Spanish descent, who not only encourage its presence near their domains, but reverence it as a pious bird, which does not work on holy days. The *Dendrocolaptidæ* are not remarkable for their song, and most of them only give forth discordant cries, but such notes as they produce are generally uttered whenever the male and female happen to meet during the day, when they greet each other with much demonstration, and, according to Mr. Hudson, they appear to have a triple note, with the accent on the first and third syllable, much as in the Tolédo mentioned below (p. 258). When singing, they stand opposite to each other with their necks outstretched, wings hanging and tails spread, "the first bird trembling with its rapid utterances, the second beating on the branch with its wings."

The oven is a very substantial structure of mud, and weighs sometimes as much as eight or nine pounds, and the birds build a fresh one every year, sometimes using their old oven as a foundation for the new house. The eggs are white; and are deposited on a lining of soft dry grass in an interior chamber of the oven. The entrance-hall can be explored by the insertion of a man's hand, but there is even then no way of reaching the eggs owing to

the small size and high position of the entrance to the nesting chamber.

Returning again to the Swifts, I may call attention to the remarkable nest made by the Tree-Swifts (*Macropteryx*). These are probably the smallest nests made by any bird, considering the size of the individual which builds them. The first of these pigmy nests which I received at the British Museum was sent from Labuan by Sir Hugh Low. The nest only measured an inch-and-a-quarter across (see p. 168), and

The Tree-Swift (*Macropteryx coronatus*).

in it were the remains of a white egg, unfortunately broken. The Kadhyan native who brought it in said that he had shot the bird with a sumpitan or blow-pipe, as it was sitting on a low tree-stump, and that he found the nest lying on the ground by the side of the dead bird, so that he believed that the latter had been carrying the nest about with her. This is, of course, impossible; but in all probability the Swift had dislodged the nest in its fall, and had broken the egg. The species found by Sir Hugh Low's collector was *Macropteryx comatus*, but the Indian Tree-Swift

(*M. coronatus*) makes the same kind of nest, and Mr. Hume describes several instances of its capture. According to the latter gentleman the nest is made entirely of thin flakes of bark, cemented together by the birds' own saliva, and is about an inch-and-three-quarters across, and half-an-inch in depth. The thickness of the nest is about the eighth of an inch, and the nest itself is placed against the side of a stem or a branch, of less than an inch in diameter, and on the same level as the latter, so that when the bird is sitting there is never any sign of the tiny nest, and the bird, which is about ten inches in length, simply looks as if it were sitting on the bough. When the nest is attached to the side of a slender branch it is not procured without some difficulty and danger, and Mr. Hume says that a lad whom he sent up to get one of them was nearly killed by the breaking of the branch just before he got to the nest.

Captain Horace Terry found a nest of this Swift in the Pulney Hills in Central India. "One day," he writes, "I went down the slopes of the hills in the Pittar Valley to see what I could get in the way of birds and eggs, and I noticed several of these Swifts about, and on looking up at a large tree, with no branches near the ground, and with a sort of gum oozing out in places, I saw a bird near the top at the extremity of one of the branches. I looked at it through my glasses and saw that it was a Crested Swift. With some little trouble I frightened it off the tree; it took a short flight and then returned to its original position; and then I saw what I took to be its nest. Under promise of a large reward I induced a native to go up to it. It was as nasty a looking tree to climb as one could well imagine, and the nest was right at the end of a dead branch near the top. However, the man having once started took a sensible view of it, went right up, but of course he could not get quite close to the nest. However, by tying a bamboo under the branch, cutting it through, and then

drawing it in, he eventually got hold of the part where the nest was. It was a tedious business, but at last he got it down, and I was very glad when I safely got hold of the nest and egg. The nest was made of a few bits of bark and feathers gummed on to the branch, and apparently in addition to the saliva of the bird, some of the gum of the tree itself had been used."

The nest of the Javan Tree-Swift (*M. longipennis*) is described by the late Dr. Bernstein in very similar terms. He says that it was a very delicate structure, only just large enough to receive the single bluish-white egg, and the walls were no thicker than parchment. He observed that the bird did not sit on the nest itself, as the latter was not strong enough to support its weight, but it perched on the slender bough close to the nest, so that it was able to cover the latter with the feathers of its belly.

One curious habit of the Crested Tree-Swift of India (*M. coronata*) must not be passed over without remark, and that is their method of roosting. Mr. Stuart Baker tells us that "just after sunset one hears a harsh scream overhead, then another, and another, as one by one the birds collect. On arriving at their proposed roosting-place they fly round and round, gradually lowering their flight until one bird suddenly makes a sweep and settles on some part of the tree near the top. This is the signal for the rest to perch, and in a few minutes they are all dotted about the higher branches. Then they begin to close up with the bird which first alighted on the tree, finally collecting in a feathery ball, one on the top of the other. The first attempt, however, is seldom satisfactory, and they scatter abruptly, when the same performance is again gone through. Sometimes this happens again and again before they get settled, but at last the twittering stops and they are asleep for the night. It is wonderful how compactly these birds close up;

a flock of eleven appeared not to take up a space more than a foot long by about half that breadth." Mr. Stuart Baker also says that the same habit of roosting is indulged in by the Indian Swallow-Shrike (*Artamus fuscus*), which is a much commoner species than the Tree-Swift. It will be remembered that Gould figures, in his 'Birds of Great Britain,' a remarkable instance of the gathering of a roosting mass of our Long-tailed Tit (*Acredula vagans*), while the Colies (*Coliidæ*) of Africa are also said to roost together in small parties of six or eight, each bird clinging one to the other.

CHAPTER VIII

WONDERFUL NESTS

Weaver-birds' Nests in Liberia (*after Büttikofer*).

Stick-nest Builders—Hammer-heads—Fire-wood Gatherers—Moss-nest Builders — Felt-nest Builders — Penduline Tits — Rock Warblers—Purse-nest Builders—Weaver-birds—Grass-Warblers —Humming-birds as Engineers — Sun-birds — Salvin's Swift—Assemblages of Albatrosses and Terns.

No bird makes a more extraordinary nest than the Hammer-head (*Scopus umbretta*), a kind of Stork of a sober brown colour found in Africa, Arabia, and Madagascar. It has a compressed bill, terminating in a hook, and its nearest ally in the Class *Aves* is the peculiar Shoebill (*Balæniceps rex*) already described (p. 38). It makes a nest of sticks in a tree, or more frequently on a rock ; and

several nests are sometimes found in close proximity, some of them being accessible, while others are perched at such a height on the rock as to be unapproachable. The nest is often of large size, and is formed of quite a cart-load of sticks. It is so firmly constructed that it will bear the weight of a heavy man: it is repaired year after year and added to, and the birds appear to have considerable ideas of decorating their home, like the Bower-birds of Australia, for Mr. Layard says that he has found brass and bone buttons, bits of crockery, bleached bones, etc. The nest is described by other observers as having three chambers, communicating with each other by a narrow doorway, through which the bird can easily pass its slim body. The eggs, which are three to five in number and white, are laid in the highest portion of the interior of the nest, which is described as the sleeping-chamber. This is plastered with mud inside, and the nest itself is made of water-plants. The middle chamber is supposed to be for the young birds to live in when they leave the nest, and the ante-room is used as a post of observation.

Among our British birds we have also a deft architect in stick-building in our common Magpie (*Pica pica*), which builds a domed nest, and some of the smaller European Herons construct an elegant little cradle of sticks; but most of the Herons' nests composed entirely of twigs and sticks are flat, and form little more than a platform, as is the case with Pigeons. In Argentina, however, there is an extraordinary bird which goes by the name of the Fire-wood Gatherer (*Anumbius acuticaudatus*), and this bird seems to be one of the most interesting of stick-nest builders. A nest of the *Anumbius* was presented to the British Museum by the Directors of the Pacific and European Telegraph Company, and not only is it a very compact mass of sticks, but interwoven with the latter are a number of pieces of telegraph-wire. These birds frequently build their nests on

Nest of the Fire-wood Gatherer (*Anumbius acuticaudatus*).

the cross-arms of the telegraph-poles and interfere at times with the working of the lines.

The Fire-wood Gatherer seems to be an amiable little bird, and for months after the young have quitted the nest, the old birds and their family keep together and use it as a roosting-place. Mr. W. H. Hudson thus describes their life—

"To build, the *Añumbi* makes choice of an isolated tree in an open situation, and prefers a dwarf tree with very scanty foliage; for small projecting twigs and leaves hinder the worker when carrying up sticks. This is a most laborious operation, as the sticks are large, and the bird's flight is feeble. If the tree is to its liking, it matters not how much exposed to the winds it may be, or how close to a human habitation, for the bird is utterly unconcerned at the presence of man. I have frequently seen a nest in a shrub or ornamental tree within ten yards of the main entrance to a house; and I have also seen several on the tall upright stakes of a horse-corral, and the birds working quietly, with a herd of half-wild horses rushing round the enclosure beneath them, pursued by the men with lassoes. The birds use large sticks for building and drop a great many; frequently as much fallen material as would fill a barrow lies under the tree. The fallen stick is not picked up again, as the bird could not rise vertically with its load, and is not intelligent enough, I suppose, to recover the fallen stick, and to carry it away thirty yards from the tree and then rise obliquely. It consequently goes far afield in quest of a fresh one, and having got one to its liking, carefully takes it up exactly by the middle, and carrying it like a balancing-pole returns to the nest, where, if one end happens to hit against a projecting twig, it drops like the first. The bird is not discouraged, but after a brief interview with its mate, flies cheerfully away to gather more wood.

"The nest of the *Añumbi* is about two feet in depth, and from ten to twelve inches in diameter, and rests in an

oblique position among the branches. The entrance is at the top, and a crooked or spiral passage-way leads down to the lower extremity where the breeding chamber is situated; this is lined with wool and soft grass, and five white eggs are laid, varying considerably in form, some being much more sharply pointed than others."

Moss-nests are among the most beautiful of the structures for which birds are responsible, especially as in most cases the exterior of the nest is decorated with lichens and other grey material, such as spiders'-webs, which often make the nest appear like a small excrescence on the branch, and thus succeed in protecting it from observation. Some of the greatest adepts of this art of concealment are found among our British species, such as the Chaffinch and the Goldfinch, both of which build beautiful nests of moss ornamented with lichen, but in the case of some foreign birds the concealment of the nest among the surrounding mosses is carried out to an extreme, and it is impossible to detect it in the midst of the hanging moss or lichen. Some species, such as Whitehead's Broadbill (*Calyptomena whiteheadi*) from the mountains of Northern Borneo, make their nest out of the same lichens which hang from the surrounding trees in the forests damp with their continual rain. The nest is rather substantially built in the shape of a purse, and the lichens are woven into it and round the slender branch from which it is suspended, ending in a pointed tail of lichen, so as exactly to resemble the streamers of moss which hang from the trees on every side.

Some of the smaller birds most artfully conceal their nests in this way, and in the Bird Gallery at the Natural History Museum will be seen a capital example in the nest of the Black-cheeked Hill-Tit (*Yuhina nigrimentum*), where the bird has built its little home under a narrow bough so thickly covered with lichens and silvery moss that the nest looks like part of the tree. The Small Warblers of

Australia (*Acanthiza* and *Sericornis*) likewise protect their nests by either building them in a mass of overhanging

Nest of the Yellow-throated Warbler (*Sericornis citreogularis*). (*After* Gould.)

moss at the end of a bough, or in accumulating moss round them so that they resemble their surroundings exactly. In

the case of the Yellow-throated Warbler of Australia (*Sericornis citreogularis*), the little bird selects some hanging branch of a moss, which grows in the dense and humid forests, and often hangs down in long streamers a yard in length from the end of the drooping branches. Into these moss-streamers the Warbler penetrates and builds its nest in security, as there is nothing to show that the pendent

Nest of a Penduline Tit (half natural size), from East Africa.

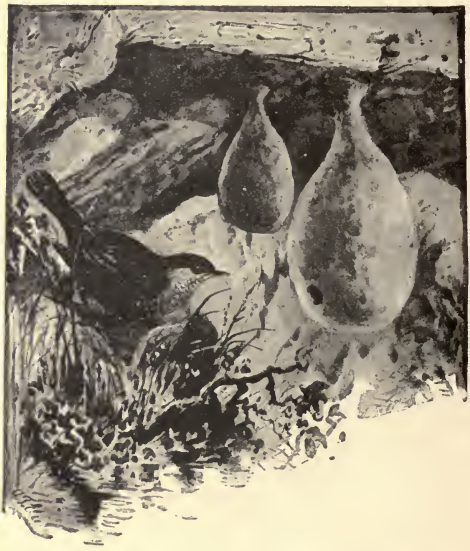
mass of moss is inhabited or differs in any way from the others which hang on every side in the vicinity. Other species of the genus *Sericornis* build rounded nests of moss at the end of overhanging branches, and either make them of the shape of the lumps of moss which are to be seen everywhere around them, or else decorate their nests with lichen so that they cannot be distinguished from any of the tufts of moss on the neighbouring branches. In the nest of one little Warbler (*Geobasileus chrysorrhœus*) from

Australia, there is attached a roosting-place for the male; at least so it is said. The nest is a domed and carelessly made structure of wool, leaves, and grass, and on the top or side of the nest is a cup-shaped depression intended

Nest of the Cape Penduline Tit, or Cotton-bird (*Remiza capensis*), from South Africa.

for the male. The same story is told about the felted nests of the Penduline Tits of the genus *Remiza*. The homes constructed by these tiny creatures are so extraordinary that they could hardly be believed to be the work of a bird at all. On handling one of their nests it

feels as if it were made of the finest felt carpet, and how the birds contrive to weave it out of cotton and seed-down is a mystery. Towards the upper end of the nest is a funnel-shaped opening, and below this is a distinct little pocket, the use of which is not clearly understood, though,



Nest of the Rock-Warbler (*Origma rubricata*). (*After* Gould.)

as in the case of the Australian Warbler mentioned above, it is supposed to be a roosting-place for the male, for whom, as the nestlings grow larger, there would be no room in the nest itself. The little birds are said to draw in the tubular entrance of the nest before they finally go to sleep, and they then fasten it up tightly, so that any enemy, snake or

otherwise, on attacking the nest, fumbles about at the pocket or false entrance, while the little birds peck a hole in the back part and escape.

Another very remarkable nest is that of the Rock-Warbler of Australia (*Origma rubricata*), and it is suspended under a rock or cave in the solitudes which it loves to frequent. It is a very shy little bird, and never seems to perch in trees or to frequent the forests, but lives among the rocks and the water-gullies. The nest is of an oval shape, and is made of moss, the entrance-hole being pierced in the latter just before the feather-lining is prepared for the interior; but the curious feature of the nest is the way in which it is suspended by a narrow neck to the roof of the cave or rock.

Weaver-birds make as wonderful nests as any birds, for they weave a kind of large oval purse out of strips of palm-leaves and grass, and an examination of their work shows that these industrious little people are able to twist and bind and knot together the materials of which the nest is composed in a way that would do credit to any straw-worker. The nests are generally suspended at the end of the boughs of a palm or other tree, and in most cases overhang the water, so that it is difficult for any Snake or Monkey to reach them. Many species add a kind of long stocking or funnel to the entrance to the nest, which renders it difficult for any animal to attack the eggs or young birds, which are housed inside in an ordinary cup-shaped hollow. Snakes are, however, persistent enemies of the Weaver-birds, and my friend, Mr. F. J. Jackson, who found a nest with young birds in Uganda, on returning to the nest the next day, inserted his fingers, only to light on the cold body of a Snake, which had eaten the nestlings and coiled itself up in the nest.

The Weaver-birds are fond of nesting in a community, and sometimes as many as a hundred nests are found upon

the same tree. Some species, like the Black Weaver-birds (*Textor*) of Africa, build their nests in common, collecting a great heap of dry sticks and twigs and forming them into a huge mass, in which they make five or six grass-lined nests united together, and if any injury is done to the colony, they all work together to repair the damage, and the common nest is added to year after year. The Sociable Weaver (*Philæterus socius*) makes, perhaps, the most extraordinary nest of any of the Family, for it lives always in company, and many birds use the great hive-like structure which forms a conspicuous feature in the parts of South Africa where the species is found. When not used for nesting purposes, their common house serves as a roosting-place, and sometimes the nest is said to consist of at least a cart-load of sticks and grass, and to be perfectly weather-proof. In the under side of the mass, with the openings from below, are pierced a number of chambers, lined with feathers, in which the pair of Sociable Weavers rear their young. The late Mr. Andersson says that in Damara Land these Weaver-birds, when breeding, "incubate their eggs under the same roof, which is composed by these birds of whole cart-loads of grass piled on a branch of some camel-thorn tree in one enormous mass of an irregular umbrella-shape, looking like a miniature hay-stack, and almost solid, but with the under surface, which is nearly flat, honeycombed all over with little cavities, which serve not only for incubating, but also as a refuge against rain and wind."

Many of the Weaver-finches (*Estreldinæ*), little birds of bright colours, inhabiting Africa, India, and Australia, also build grass-nests, domed or rounded in form, and placed either close to the ground or at a very little distance above the latter. The best known of these little Weaver-finches are the birds popularly called "Bengalis," and they will often breed in confinement, if supplied with suitable

materials for nest-building. I brought home a number of these Weaver-finches to London after my visit to India in 1885, when I went to fetch the great Hume Collection from Simla. On my return journey I had to spend a few days in Bombay, and in the company of a friend who translated for me, I visited the shop of a bird-dealer, a nice old fellow in a flowing white robe. He had a large assortment of birds in his shop, including species from Australia and the Moluccas, and I evidently impressed him by telling the names of his birds and the countries they came from. As I gradually made my selection, I heard the old gentleman ask my friend who was this person who seemed to know all about the birds; and on learning that I came from the great British Museum across the sea, he showed me over his entire menagerie. I then, through the medium of my friend, laid him a wager that I would undertake to give him the name and the habitat of every bird in his establishment, and that whenever he admitted that I was correct, he was to give me a "Bengali" or a Mynah of some sort, and that whenever I did not know the bird or where it came from, I was to forfeit a rupee. I am sorry to say that he declined the wager, and I had to pay—not much however—for the crowd of Weaver-finches and other birds I selected. They lived through the discomforts of the sea-voyage in the monsoon of July, and nearly all reached England in safety, but we found them rather monotonous and uninteresting little birds, and ultimately gave them away.

A grass-nest of another kind is made by the Fan-tailed Warbler (*Cisticola cisticola*), which is an inhabitant of Southern Europe, Africa, and India. This little bird selects a reed-bed for its breeding-place, and then proceeds to tack together several of the reeds, so that in the cavity produced by this engineering it is able to place its nest, which is a deep and narrow purse of grass and reeds, lined

with silky down. This structure, however, is surpassed in ingenuity by the Tailor-birds (*Orthotomus*) which stitch leaves together in the most experienced fashion for the support of their nests. Some of the Indian Wren-warblers

Nest of the Fan-tailed Warbler (*Cisticola cisticola*).

(*Prinia*) will sometimes sew a couple of leaves round their nest, but the same species sometimes make cup-shaped nests and discard the "tailor-made" supporting leaves, so that Mr. Hume is driven to remark—"Birds like these, which build half-a-dozen different kinds of nests, ought to

be abolished! They lead to all kinds of mistakes and differences of opinions, and are more trouble than they are worth!"

The Tailor-birds, however, are more consistent in their methods of nest-building. The nest (p. 161) is generally made of fine cotton-wool, with occasionally a lining of hair or grass-stems to keep it in shape, and enclosed in two or more leaves stitched together with cobwebs, silk, thread, or vegetable fibres. Sometimes a single large leaf is selected, and the edges are stitched across so as to envelope the nest. My friend, Mr. R. M. Adam, has told me that in his compound at Agra these little birds were very common, and he used to assist them in their nest-building by distributing thread of different colours at intervals, so that sometimes all the leaves would be stitched together with red cotton, the next week with white, and so on.

The Hang-nests (*Icteridæ*) of the New World also make nests of a similar pattern to those of the Weaver-birds, which are, however, inhabitants of the old world only, being plentiful in Africa and India. Some of the nests made by the species of *Icteridæ* are purse-like structures of coarse fibre, with a long stocking-like entrance added thereto, but some of the species, notably the Tinkler of Jamaica (*Quiscalus crassirostris*), make their nest of a curious conglomeration of rubbish at a considerable height above the ground. A mass of fibre, sticks, horse-hair, paper, skeleton leaves, grass, etc., is combined in the nest of the Tinkler, and the wonderful specimen given to the British Museum by Lady Blake was only obtained by severing the lofty bough to which it was attached, by a rifle-shot.

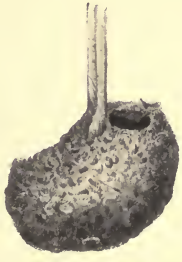
Considering the fact that Humming-birds are sometimes described as birds of low intelligence, the ingenuity which is shown in the construction of their nests is remarkable. The tiny little cups of moss which they make are truly beautiful, especially when they are decorated, as is usually

the case, with delicate lichens. In many instances it cannot be doubted that the little Hummers are imbued with a sense of the necessity of protective resemblance, and some of them have been known to place their nests on a branch in the close vicinity of a pine-cone, with one of the latter hanging from the branch above, so that the nest would appear merely as a little additional swelling like another cone on the lower branch. Professor Robert Ridgway, in his Essay on the Humming-birds,[1] has figured many of the nests constructed by these wonderful little creatures. There we see that they construct their tiny nests in every kind of situation. Sometimes they are sewn to the extreme tip of a palm-leaf, or they may be a firm cup woven on to a slender branch, and often concealed by the overhanging foliage. One very curious nest, or rather assemblage of nests, is here figured from the plate published by Professor Ridgway. It represents four separate nests of the Calliope Humming-bird (*Stellula calliope*), built one on the top of the other, apparently in successive seasons, but, as it is evident that another nest superimposed on the three others would certainly upset the balance, the fourth nest is built on the lower side, and is thus counterbalanced by the weight of the three preceding nests on the other side of the twig. This would seem to indicate a high standard of reasoning power in the Humming-birds, and many observers attribute to them remarkable intelligence; certainly

Four nests of *Stellula calliope*. (*After* Ridgway.)

[1] 'Report of the United States National Museum,' vol. for 1890, pp. 253–383.

the way in which they seem to adjust the balance of their suspended nests is wonderful. Thus Mr. John Gould, who made a life-long study of these birds, remarks—"Some of the Humming-birds are said to suspend their nests by the middle from the fine hanging roots of a tree, or a tendril; and should the nest, which is of a curved form and built of any coarse materials at hand, prove to be heavier on one side than the other, the higher side is weighted with a small stone or square piece of earth until an equilibrium is established and the eggs prevented from rolling out. If such powers, so nearly approaching to that of reason, should be doubted by some of my readers, I can assure them that one or more of these loaded nests are in the Loddigesian collection, and one is at this moment before me, as I write, an examination of which will satisfy the most sceptical of the truth of this statement."



Nest of *Oreotrochilus pichincha*, in the British Museum, from Ecuador.

The subjoined illustration represents a nest of the Pichincha Hill-star (*Oreotrochilus pichincha*) preserved in the Natural History Museum. It has often been figured as a curiosity since it was first discovered by Fraser on the volcano of Pichincha in Ecuador. The nest was attached to a straw rope hanging to the roof of a house which was situated at an elevation of 13,450 feet above the sea-level. It is a compact mass of wool and hair mixed with dried moss and feathers. A little cup-shaped opening at the top forms the receptacle for the eggs, and is balanced and brought into position by the weight of the moss on the opposite side of the rope by which it is suspended.[1]

Other instances of the intelligence of the Humming-bird as a nest-balancer have been recorded. Thus Professor

[1] See the 'Proceedings of the Zoological Society for 1860,' p. 80.

Ridgway tells of an instance which came under his own observation—"A nest of the Broad-tailed Humming-bird (*Selasphorus platycercus*) had been built upon a dead twig of an aspen bush, some three feet from the ground. The dry atmosphere had caused the bark of the twig to crack, making a transverse fissure on each side of the nest, the wood at the same time shrinking, so that the cylinder-like section of bark enclosed it loosely. After the eggs were laid, something had caused the section of bark to turn, so that the nest hung inverted on the under side of the branch, of course spilling out the eggs. When found by me, the nest was in this position, with the fragments of the eggs lying on the ground beneath it ; but immediately above the original nest was a new one, very much smaller than the first, containing two fresh eggs. Evidently the owner knew that by building a much smaller nest above the old one, which was rather a bulky one for the species, the greater weight of the latter would keep the former in position, and thus prevent a recurrence of the accident."

Sun-birds (*Nectariniidæ*) make beautiful little purse-like nests which they suspend from a twig, and decorate with lichens, spiders'-webs, and cocoons of moths, and over the entrance-hole is generally a kind of porch or cornice. The birds often place their nests in most conspicuous places. A nest of the Purple Sun-bird (*Cinnyris asiaticus*) was recently presented to the British Museum by Mr. E. F. Bourdillon, and was built on a croton plant in his father's garden at Bankipore. It is made of fine grass-bents with moss and spiders'-webs interwoven, and presents a silvery white exterior from the number of white cocoons with which it is decorated. This seems to be the usual ornamentation adopted by the species, as Mr. Hume describes the nest as "pendent, and composed of all kinds of materials, beautifully woven together with the silkiest of fibres and cobwebs, while hair, fine grass, pieces of decayed wood, lichens, rags,

thorns, etc., are all pressed into the service. The body of the nest is oval, as a rule with all sorts of little pendent pieces of wood, etc., hanging below, apparently as ornaments, while the apex of the oval is prolonged into a cone meeting the point of support. A little above the centre of the oval a small circular aperture is masked, and just above it a projecting cornice, one or one-and-a-half-inches wide, is extended; then, on the opposite side of the oval, the wall of the nest, which is ready some days before the eggs are laid, is pushed out or bulged out a little, so as to give room for the sitting bird's tail. The bulging out of the back of the nest is one of the last portions of the work, and the female may be seen going in and out, trying the fit, over and over again. When the bird is sitting, its little head may be seen peeping out of the whole under the awning."

The Sun-birds lay but two eggs, as a rule, though in some instances three are found. This is in great contrast to the numerous eggs which the Tits lay, but it has been pointed out by Mr. Whitehead and other field-naturalists that birds in the tropics lay fewer eggs than their representatives in northern climates. The beautiful little nest of the Purple Sun-bird appears to be constructed entirely by the female, the male taking no share in the building of the nest or in the rearing of the young. Mr. R. M. Adam states that a nest built in the verandah of his house at Agra was finished by the hen-bird, and the latter was actually sitting on the eggs before the male bird put in an appearance. When he did do so, the nest apparently met with his approval. "Now he seemed exceedingly happy," says Mr. Adam, "for he fluttered every now and then about the nest, and after each careful inspection, he was seemingly so pleased with the handiwork of his mate, that he perched on an adjoining branch and poured forth a joyous strain, flapping his wings and making his yellow axillary plumes rotate in the most extraordinary manner. It does seem strange that

the male of this species should not take any part in the construction of the nest, or in the hatching or rearing of the young; but I presume that the reason is, that his conspicuous plumage about the nest would attract the attention of birds that might destroy it."

One of the most curious nests in the world is to be seen in the Bird Gallery at the National History Museum, and is the work of Salvin's Swift (*Panyptila sancti-hieronymi*) from Guatemala. It is entirely composed of seeds, but whether the bird gathers these from the plants or catches them in the air as they are blown by the wind, has not been observed. In this way the scanty material for the nests of our European Swifts (*Apus apus* and *A. melba*) are obtained, but in the Guatemalan species the nest is of such huge size that it would take a very long time or the co-operation of many pairs of birds to collect the seeds in full flight. The nest was found by Mr. Osbert Salvin in 1858, hanging under a shelf of rock, to which it was attached by means of the bird's own saliva, which is also employed throughout the building of the nest, to cement the seeds together. As with the Penduline Tits mentioned above (p. 214), the nest of this Swift also had a false entrance at the side, which Mr. Salvin considered might "be placed there to deceive some enemy, such as a Snake or Lizard, to the attacks of which the parent bird and its offspring would, during the time of incubation, be more exposed." It may also be mentioned that many species of birds appear to build false nests to draw away attention from the real habitation. This is certainly done by our Common Wren (*Anorthura troglodytes*), which builds what are known as "cock-nests." These may generally be told from the real nest by the absence of the lining of feathers, and in this way they are often mistaken for unfinished nests of the species.

The assemblages of some of the Sea-birds for the purposes

of nesting has been described by many writers, and they constitute a curious picture of bird-life. The Frigate-birds (*Fregata*), for instance, which love the open sea, and are birds of prodigious powers of flight, assemble at the breeding-season and nest in colonies on certain islands in the Tropics. The nests are placed on trees or bushes, and both sexes participate in the task of incubation. Penguins too gather together in vast numbers on the rocky islands of the Southern Ocean, and nest in company; but perhaps some of the most marvellous instances of an assemblage at the breeding-time is to be noticed in the Albatrosses (*Diomedea*). On the bare island of Laysan in the Pacific, Mr. Palmer, who was collecting there for the Hon. Walter Rothschild's Museum, found the Laysan "Gooney" (*Diomedea immutabilis*) in thousands, covering the island in fact, the young being in some places "as thick as they could stand." The birds are absurdly tame, and lay their eggs about anywhere. Some idea of the scene presented by the White Albatross on Laysan can be gained by a study of the photograph presented to the Natural History Museum by Mr. Rothschild.

On French Frigate Island, near Laysan, a marvellous gathering of the Sooty Terns, or Wide-awakes (*Sterna fuliginosa*), was also observed by Mr. Palmer, and a photograph of this extraordinary assemblage has also been presented to our Museum by Mr. Rothschild. This same species of Tern also herds in countless numbers on Ascension Island, and "Wide-awake Fair," as the nesting-place is called, has often been alluded to in works on ornithology. One of the best accounts of it is that given by the late Commander Sperling, who found the "fair" to consist of a plain about fifteen acres in extent, in the interior of this most desolate of islands. He says that no words can give an adequate idea of the effect produced by thousands upon thousands of these wild sea-birds floating and screaming over the arid

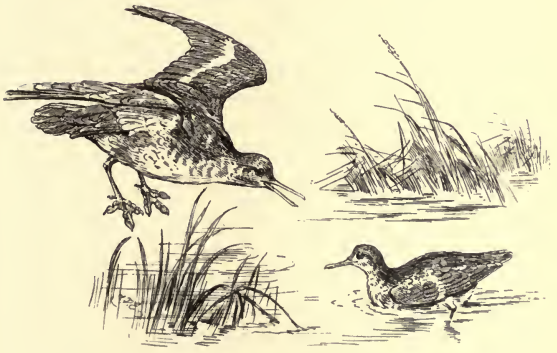
cinder-bed, the eggs and young being scattered so thickly on the ground that it was often impossible to avoid treading on them. Only a single egg is laid, and the bird defends its treasure most courageously.

Although Terns are birds which usually lay their eggs on the sand, or on the grassy flat of an island, there are some remarkable exceptions in the Noddy Terns of the genus *Anous* and *Gygis*.

The latter genus contains two snowy-white species, and no nest is made by them. Their single egg is often deposited on the leaf of a cocoanut-palm, in a position, as one would think, of great danger, but it swings in the wind apparently without risk of being broken.

CHAPTER IX

THE COURTSHIP AND DANCING OF BIRDS



The Courting of the male Red-necked Phalarope by the female.

Superiority of the Female—Hemipodes—Painted Snipes—Phalaropes—Dancing of the Black Grouse—The "Spel" of the Capercailie—The "showing-off" of the Great Bustard—The Bustard's pouch—The Ruff's display—The Crane's performance—The Rook in love—The dance of the Jacana—The "Bailador" in "song and dance."

IT cannot be denied that, in the majority of the species of birds, the reverse of what we know to be the case with human beings is an evident fact, and the males are by far the handsomer birds. Nevertheless, in a few instances, the hen-bird is the best looking of the two. In

the Birds of Prey, for example, the female is generally the larger and more powerful bird, though the sexes are, with few exceptions, alike in plumage; but in certain other cases the plumage of the hen is brighter and more ornamental than that of the male. Where the male is decidedly the inferior being, it would seem that he is made to perform the duties of incubation, though this fact cannot be insisted upon as a sign of inferiority, for in many species the male and female equally assist in the hatching of the eggs and the rearing of the young. As before noticed (p. 16), the young of the Ratite birds are always under the charge of the father, and not only do the Ostriches and Rheas illustrate this phenomenon, but the most Ostrich-like of the Game-birds, the Tinamous, likewise observes the same method of incubation.

One of the most curious instances of the superiority of the female over the male, both in size and beauty of colouration, is seen in the Hemipodes or Bustard-quails (*Hemipodii*). These are little birds, not much bigger than our common Sparrow. In appearance they resemble ordinary Quails, but they are distinguished from the latter and the rest of the Game-birds by the absence of the hind-toe, although in the Collared Plain-wanderer (*Pedionomus torquatus*) a rudimentary hind-toe is present. The Hemipodes are only found in the Old World, and are inhabitants of Africa, India, China, the Burmese countries, the Malayan Peninsula and islands, as far as the Australian continent. Thus the genus *Turnix* has a very wide range, which, in addition to the countries enumerated above, embraces the countries of the Western Mediterranean basin, where the Andalusian Hemipode (*Turnix sylvatica*) is found. In most species of the genus the female is not only larger than the male, but she is even more brightly coloured than her mate, and though such a difference of plumage does not amount to much in a Hemipode, yet it is

Indian Hemipodes (*Turnix taigoor*).

Male. Female.

sufficiently marked. The male is a very plain-plumaged little fellow, but the female towers above him in size, and has often a black throat or a rufous collar as a distinguishing character. It must be observed, however, that some of the Hemipodes scarcely differ in colour and markings, and these may be considered the more ancient species of the genus, which apparently once had the sexes alike in colour, while those, in which the hen birds have acquired a more attractive pattern, will probably be a more recent development from the primitive form, though it is a little surprising that the higher style of colouration should have been acquired by the females instead of by the males, as has generally been the case in the class *Aves*. The nesting-habits of the species might possibly be considered to be too extraordinary to be true, if they had not been observed by several excellent naturalists. Thus in regard to the life-history of the Common Hemipode or Bustard-quail of India and China (*Turnix taigoor*), Mr. A. O. Hume gives the following account—"The most remarkable point in the life-history of these Bustard-quails is the extraordinary fashion in which the position of the sexes is reversed among them. The females are the larger and handsomer birds. The females only call, the females only fight, and the natives say that they fight for the males, which is probably true. What is certain is that, whereas in the case of almost all the other Game-birds, it is the males alone that can be caught in spring-cages and other traps, to which they are attracted by the calls of other males, and to which they come for the sake of a fight, in this species no male will ever come to a cage baited with a male, whereas every female within hearing rushes to the cage in which a female is confined, and if allowed to meet during the breeding-season, any two females will fight until one or the other is dead, or nearly so.

"The males, and the males only, as we have proved in

numberless cases, sit upon the eggs, the females meanwhile larking about, calling and fighting, without any care for their obedient mates; and lastly the males, and the males only, I believe, tend the young, and are to be flushed along with the brood. In nearly all the higher sections of the Animal Kingdom, we find the males fighting for the females, and the latter caring for the young. Here, in one insignificant little group of tiny birds, you have the ladies fighting duels to preserve the chastity of their husbands, and these latter sitting meekly in the nursery and looking after the youngsters." As will be seen further on, the ladies of the Hemipode class are not the only birds which do the courting, but they are well known in the East as redoubtable fighters, and they—that is the females, for the insignificant little males are not taken into account—are said to be kept on purpose for prize combats, precisely as in England, in the old days, game-cocks were matched against each other for wagers. No wonder then that the superiority of the female *Turnix* is shown by her disregard for her husband, and the fact that she is aware of her own larger build and superiority of plumage is demonstrated by her contempt for her parental obligations, and by the scrape in the ground which she supposes to be a nest. After having deposited her three or four eggs in this apology for a nest, she leaves the incubation and rearing of the young to be performed by her husband, weak little man that he is, while she roams about seeking for some equally strong-minded lady to fight with.

Most of the Snipes and Sandpipers show a superiority in the female sex, but this is usually confined to size alone, and no beauty of plumage accompanies the larger dimensions of the female. Indeed the hen birds of the Waders, though distinguished by their larger size and longer bills, are distinctly inferior in richness of plumage to the males. Thus the female of our Grey Plover (*Squatarola helvetica*),

or our Golden Plover (*Charadrius pluvialis*), never gets such perfectly black breasts in the breeding-season as do the male birds, and the hens of the Godwits (*Limosa*) never have the red breasts so intense as in their mates. Never-

Female of the Painted Snipe (*Rostratula capensis*).

theless there are certain members of the Family *Charadriidæ* (Plovers and Snipes) in which the female is more brightly plumaged than the male. This is especially noticeable in the Painted Snipes of the genus *Rostratula*. These birds are found in Africa, India, Australia, and even in South

America, but only three species are known throughout this wide area. Of these the South American species (*R. semicollaris*) shows no difference between the colouring of the sexes, but in the African and Indian forms of Painted Snipes, although both sexes are decidedly handsome birds, the female is much brighter in colour than the male, and has chestnut on the neck and throat, while she is also larger in size than her mate. This has doubtless something to do with the protective colouration of the bird during the nesting-season, but nothing is known as to whether the male, which is the plainer in colour, performs the duties of incubation.

The greatest difference in the colour of the sexes of the Wading-birds is met with in the Phalaropes, small but elegant little creatures, which breed in the Arctic Regions of both the Old and New Worlds. They swim remarkably well, and their plumage is more like that of the Grebes, being very close-set and oily, and they likewise show another Grebe-like character in the serrated or saw-like edge which is noticeable on the hinder margin of the tarsus. In their breeding-homes they are extremely tame little birds, but the female is most in evidence, and the following amusing account of the lady's forwardness in courting is given by Mr. E. W. Nelson, a well-known American field naturalist, who saw much of bird-life in Alaska. The memoir written by this author on his natural history collections is a work little known in England, and the picture of these Arctic regions is so well painted by the author, that I have been induced to transcribe his account of the Red-necked Phalarope (*Phalaropus hyperboreus*) in full.[1]

"As summer approaches on the Arctic shores and the coast of Bering Sea, the numberless pools, until now hidden under a snowy covering, become bordered or covered with

[1] 'Report upon Natural History Collections made in Alaska in the years 1877–1881,' pp. 99–100.

water; the mud about their edges begins to soften, and through the water the melting ice at the bottom looks pale green. The Ducks and the Geese fill the air with their loud resounding cries, and the rapid wing-strokes of arriving and departing flocks add a heavy bass to the chorus which greets the opening of another glad season in the wilds of the cheerless north. Amid this loud-tongued multitude suddenly appears the graceful fairy-like form of the Northern Phalarope. Perhaps, as the hunter sits by the border of a secluded pool still half covered with snow and ice, a pair of slight wings flit before him, and there, riding on the water, scarcely making a ripple, floats this charming and elegant bird. It glides hither and thither on the water, apparently drifted by its fancy, and skims about the pool like an autumn leaf wafted before the playful zephyrs on some embosomed lakelet in the forest. The delicate tints and slender fragile form, combining grace of colour and outline with a peculiarly dainty elegance of motion, render this the most lovely and attractive bird amongst its handsome congeners.

"The first arrivals reach St. Michael's in full plumage from May 14 to 15, and their number is steadily augmented until, in the last few days of May and June 1, they are on hand in full force and ready to set about the season's cares. Every pool now has from one to several pairs of these birds gliding in restless zig-zag motion around its borders, the slender necks at times darting quickly right or left as the bright black eyes catch sight of some minute particle of food. They may be watched with pleasure for hours, and present a picture of exquisite gentleness which renders them an unfailing source of interest. The female of this bird, as is the case with the two allied species, is much more richly coloured than the male, and possesses all the 'rights' demanded by the most radical reformers. As the season comes on when the flames of love mount high,

the dull-coloured male moves about the pool, apparently heedless of the surrounding females. Such stoical indifference usually appears too much for the feelings of some of the fair ones to bear. A female coyly glides close to him and bows her head in pretty submissiveness, but he turns away, pecks at a bit of food and moves off; she follows, and he quickens his speed, but in vain; he is her choice, and she proudly arches her neck, and in many circles passes and repasses close before the harassed bachelor. He turns his breast first to one side, then to the other, as though to escape, but there is his gentle wooer ever pressing her suit before him. Frequently he takes flight to another part of the pool, all to no purpose. If with affected indifference he tries to feed, she swims along side by side, almost touching him, and at intervals rises on wing above him, and, poised a foot or two over his back, makes a half-dozen quick, sharp wing-strokes, producing a series of sharp, whistling noises in rapid succession. In the course of time it is said that water will wear the hardest rock, and it is certain that time and importunity have their full effect upon the male of this Phalarope, and soon all are comfortably married, while materfamilias no longer needs to use her seductive ways and charming blandishments to draw his attention. About June 1 the dry, rounded side of a little knoll, near some small pond, has four dark, heavily-marked eggs laid in a slight hollow, upon whatever lining the spot affords, or, more rarely, upon a few dry straws and grass-blades, brought and loosely laid together by the birds. Here the captive male is introduced to his new duties, and spends half his time on the eggs, while the female keeps about the pool close by. In due time the young are hatched and come forth, beautiful little balls of buff and brown."

In the Lark-heeled Cuckoos (*Centropus*), which are found in Africa, India, and China, and from thence south to the

Moluccas and Australia, the female is generally the larger bird, but it is not known that the smaller male is destined to the bringing up of the family. The nest which these birds build is a domed structure of grass on the ground, and the birds themselves are inhabitants of the bush, some of them being so like Game-birds in their walk and appearance that they have been called Pheasant-Cuckoos. In the *Centropi*, however, there is no difference in plumage between the sexes, and the long claw on the hind-toe, which has gained for them the name of "Lark-heeled Cuckoo," is present in both male and female birds. Thus we know at present of only the difference in size between the sexes of these tropical Cuckoos, and in this respect they resemble the Birds of Prey. In the latter the female is generally the larger bird, but not invariably, for many of the *Accipitres* differ very little as regards the size of the male and female, and where there is a great dissimilarity in colour, the advantage lies on the side of the male, as is seen in the Kestrels (*Cerchneis*) and in the Harriers (*Circus*)

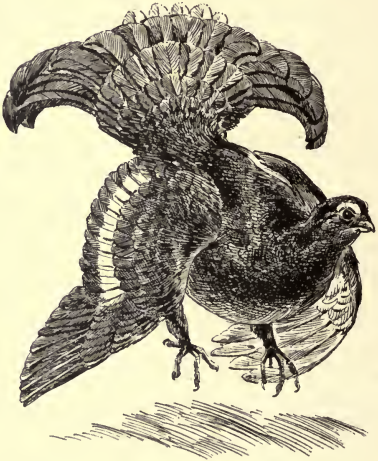
In many species of birds where the males are of more distinguished appearance or of brighter plumage than the hens, there is often a great display on the part of the former, indulged in, no doubt, for the purpose of winning the regard of the ladies, and of showing what fine fellows the male birds really are. In this there is something which will appeal to the ordinary man. Thus, when a swain enters the drawing-room of the house where his intended dwells, he has not donned his frock-coat and white waistcoat, his light gloves and the flower in his buttonhole, for nothing, and though he does not *say* on the entrance of the adored one, "Did you ever see such a nice man as I am?" he *means* it all the same. Just in the same way does the Peacock, that emblem of vanity, raise on high his spangled train, and strut in presence of the female, shaking his beautiful "hundred eyed" feathers,

to impress on his intended bride the fact that there is nothing in the bird-world that can compare with the show of star-spangled plumes which his love for her impels him to display. A remarkable show it is, but there are many birds which go through an equally wonderful exhibition of love-making. Consider, for instance, the antics in which many birds indulge in the courting season. Can there be anything more curious than the infatuation which seems to possess some of the Game-birds, like the Capercailie (*Tetrao urogallus*) and the Black-cock (*Lyrurus tetrix*)? Of the former bird we in England can know but little, as it is entirely confined to the pine-forests of Scotland, where it is now once more plentiful in certain districts. Although an indigenous species in Britain, it was so badly protected that it became extinct, just as it is, at the present time, being exterminated by indiscriminate shooting in several of its Norwegian habitats. Reintroduced by the Marquis of Breadalbane, and protected by sensible game-laws, the Capercailie flourishes in many parts of Scotland, and there is now little fear that it will be again eliminated from the rota of British birds. Unfortunately for the safety of the male, he has the extraordinary habit of "leking," as it is called, in the spring-time. He is extremely pugnacious, and fights to the death for the sovereignty of the harem, so that on some occasions two cock birds will fight with such desperation that they become exhausted with the battle, and both are captured by the hunter. It is only when two old birds meet that such a battle-royal ensues, for the adult male drives off all the younger ones, and reigns supreme in his own district. It is then that he begins to "lek," which but too often leads to his destruction, for the hunter, who knows the habits of the bird, can then approach him in his delirium, and kill him while in the full enjoyment of his ecstasy. It is in the morning and evening that the male Capercailie sings his love-song or "spel," seeking a

quiet part of the forest, and working himself up to such a pitch of oblivion that he falls a victim to the hunter. Seated on a bough in the pine-forest, with his neck outstretched and the long feathers of the throat blown out to their full extent, he spreads his tail up like a fan and proceeds to utter his love-song, which consists of three notes, frequently repeated, until at last the bird arrives at such a state of blind excitement that he can be approached by any hunter acquainted with his habits at the "leking" time. I have had many conversations about the habits of the Capercailie with my young Norwegian friend, Nicolai Hanson, who is now sailing as naturalist on board the *Southern Cross* with Sir George Newnes' expedition to the Antarctic Continent, under the leadership of Mr. Borchgrevinck. Nicolai tells me that although he has shot many Capercailies in the pine-woods, it is by no means so easy a task as many people might think. Notwithstanding the great size of the bird, it is of such a shy and suspicious nature that it is not easy to penetrate within reasonable distance without its taking alarm, and even when the "spel" is upon it, the hunter must proceed with the utmost caution and wait in silence between the utterance of the love-notes, as the slightest sound or the snapping of a twig will alarm the bird and cause it at once to retreat to the depths of the pine-forest. My Norwegian friend also found fault with our illustrations of the nesting habits of the Capercailie and the Blackcock in the Natural History Museum. In each instance we have introduced the male bird of both of these species to show what they are like, but Nicolai maintains that to find a male of either species in the vicinity of the nest when the female has either eggs or young birds, is an impossibility, for at that time the males disappear and are never in evidence. He assures me that he has devoted much time to scouring the forests in Norway to discover the male birds of these Grouse

during the nesting season, and he has no idea where they retire to, but so far he has never succeeded in shooting a male in the full summer season.

The Black Grouse (*Lyrurus tetrix*) resembles the Capercailie in many of its habits, and, like that species, is polygamous, the old males fighting for the possession of



Male Blackcock dancing.

the females. It seems, however, that the Black Grouse has meeting-places and playing-grounds, where the cock-birds dance, and where, if a rival ventures to intrude, a furious fight takes place. The antics indulged in by the male when he is "showing off" are said to be most extraordinary. Not only does he strut round and round with outspread tail, but he springs into the air and executes a most entertaining *pas seul*. Like the Capercailie, as soon

as the eggs are laid and the young birds have to be attended to, the male birds disappear, and it would seem that they go through a thorough process of moult, shedding their beautiful tails, and being scarcely able to fly. The males then put on a hen-like plumage on the head and neck, which resembles the dress of the female birds, and doubtless this temporarily-assumed plumage helps to conceal the bird in its defenceless condition, when the ordinary black head and neck of the male bird might render it easily conspicuous.

Ducks also go through a wonderful transformation of plumage, as may be seen by the series of specimens of the Mallard (*Anas boscas*) given to the Natural History Museum by Lord Walsingham and exhibited in the Great Hall of that Institution. The beautiful plumage of the male bird is that of winter, for in summer, after the female has begun to hatch the eggs, he proceeds to throw off the fine feathers which render him such a handsome object, and he dons for a few weeks a dull-coloured dress which is scarcely to be distinguished from that of the hen. At the same time he moults all his quills, and is practically defenceless, so that he is obliged to hide himself away until his wings have grown again. By gradual and slow degrees the male bird regains his bright plumage, but this is a work of time, and the full livery is not completely put on till the late autumn. This shedding of the brilliant plumage and the passage to the duller or "eclipse" stage, as it is called, doubtless acts as a protection to the species during the time when it cannot fly, as the brown colouration is less likely to attract attention. Sea-birds, like the male Eider-ducks (*Somateria*), which have a particularly attractive plumage when adult, leave the neighbourhood of their nesting-grounds as soon as the young are hatched, and betake themselves to the open sea, to pass through their "eclipse" stage, and regain their wing-feathers. Whether

the males of all ducks go through a similar change of plumage in the breeding-season is not known, but there is every reason to believe that they do.

One of the most extraordinary displays of "showing off" is that of the great Bustard, as is seen in the accompanying illustration. When the male wishes to attract the attention of the female bird, he first approaches her with short steps, lifting his feet from the ground and rustling his wings. His next proceeding is to throw his tail flat over on to his back and to spread his shoulders out, so that, by crossing the ends of the long primary quills, he is enabled to keep the tail down, and he then ruffles up all his back-feathers and scapulars, so as to completely hide the wings and the tail together. The white under tail-coverts are then brought up, so as to form a kind of fringe or "halo" at the back of the bird, who next proceeds to make an attempt to turn the feathers of the wing inside out. The white inner secondaries which lie nearest to the back are raised and thrown over the latter, and in order that there may be no mistake about these being seen, the bird flings down the long parapteral feathers which lie between the shoulders and the wing-coverts, and thus the wife is enabled to admire the show of white feathers which are elevated across the back. The wing-coverts are also twisted in a similar fashion, but not quite to the same extent. Having accomplished this extraordinary contribution to the study of love-making, the Bustard then proceeds to inflate his chest, which he does by blowing out his pouch to an enormous extent; and then, burying his head in his neck so that his whiskers become upturned on each side of the head, he adds the final touch to one of the most wonderful exhibitions in nature. That *white* is an attractive colour in this display must be gathered from the extraordinary efforts put forth by the bird to show all his white plumage to the best advantage. It will have already been noticed

The Male of the Great Bustard (*Otis tarda*) showing off.

that, in the "garden" of *Amblyornis subalaris*, from South-Eastern New Guinea, black appears to be the object of admiration. (*See* p. 143.)

The picture which accompanies these notes has been drawn from the group of Bustards in the Natural History Museum. These birds were presented to us by that well-known naturalist Mr. Abel Chapman, who obtained them himself in Southern Spain. The male was the largest he ever shot, and weighed thirty-seven pounds. Mr. Chapman tells me that even with all the pains bestowed upon the mounting by our taxidermist, Mr. Pickhardt, the bird still appears to him to be smaller than when he shot it, but possibly the fact of its having been mounted from a preserved skin has prevented the acquisition of the full size to which it would have attained if it had been mounted from a fresh specimen. My readers must take it therefore that, large as the male appears to be, in life he would have looked even bigger, when showing himself off.

The pouch of the Bustard is another wonderful phenomenon. It is a bag lying between the outer skin and the œsophagus, and its orifice is below the tongue. The way in which the bird manages to distend the pouch is not yet thoroughly understood, for it has no connection with the lungs, and how it can get filled with air is a mystery. In the Australian Bustard (*Eupodotis australis*) the late Professor Garrod found a dilation of the œsophagus, but no pouch at all, though the bird, when alive, had been able to produce a quite imposing display.

All the species of Bustard seem to indulge in an exhibition of showing off in the breeding season, and some of them, like the Lesser Florikin of India (*Sypheotis aurita*), select a piece of rising ground, from which in the early morning or in dull weather they display themselves, springing in the air and uttering a note which is said to be more

like that of a frog or a cricket than that of a bird. This call is supposed to be a note of invitation to the females, or a challenge to some rival male, and is often interpreted by the latter as such, with the result that a fierce battle ensues. The hen-bird is also said to have the same habit of springing a few feet into the air.

Mr. J. G. Millais in his interesting work on South Africa, entitled a 'Breath from the Veldt,' gives several illustrations of the playing of Bustards, one instance of which he describes as follows—"Every evening as the sun approaches the horizon, the Bush-Khoorhan (*Lophotis ruficrista*) rises from the grass and mounts perpendicularly into the air, when, from a height of 100 to 200 feet, it closes its wings and drops head-first to the earth, only opening its wings to break its fall, after one of the most extraordinary aërial feats I have ever seen. Whether it is a form of evening sun-worship or a mere 'good-night' to the golden orb, I must leave my reader to determine."

One very amusing aspect of this showing off on the part of the Bustards is the extreme indifference affected by the female during the performance. Apparently she takes no notice of the antics of her mate, but goes on feeding as if the proceedings did not interest her, and all the time the male is pawing the ground, and distending his pouch, occasionally springing round to display the beautiful arrangement of white under tail-coverts which he has thrown up like a frill. The same indifference in the hen-bird is seen in the Reeve, when the male Ruff is disporting himself for her admiration. This Wading-bird (*Pavoncella pugnax*) is one of the most interesting of all the *Charadriidæ*, the Order which embraces the Plovers and Snipes. The difference between the plumage of the sexes of the Ruff is more than usually marked, and a further phenomenon is seen in the peculiar diversity of breeding dress assumed by the male bird. Scarcely any two are alike, and the large

The Courting of the Ruff (*Pavoncella pugnax*).

ruff or breast-frill varies from pure white or black to orange or chestnut, barred or spotted with black in every shape and form. Besides the ruff on the breast, the bird possesses two little crests on each side of the head, and the way in which the birds dance and pirouette is one of the most amusing sights in nature. In a wild state, the males fight for the females (hence Linnæus' specific name of *pugnax*), but little bloodshed results, for the weapons of offence in the Ruff are not of much weight, but when courting, the antics of the male birds as seen in captivity are laughable enough, for after whirling round and springing into the air, they suddenly stop before the lady, with the bill pointed to the ground, so as to bring into full display the breast-shield and at the same time the tufts of feathers on the crown, as much as to say—"What do you think of that for a show?"

The male in the genus *Pavoncella* is much larger than the female, and in the winter plumage it can be told by its size alone, as then there is very little difference in the colour of the sexes. What a pity it seems to be that, owing to the drainage of our fen-land, the Ruff no longer nests with us, as its favourite haunts have already been reclaimed, and the land too much occupied for the bird to find the marshy solitude which its soul loves! It still nests, however, though in diminishing numbers, in parts of Holland and in Denmark.

Although the male Ruff loves to fight with a rival male, like many other birds already noticed, its powers of doing injury to its enemy are limited; but in some fighting birds, distinct weapons of offence are present, as, for instance, in the sharp spurs possessed by some of the Spur-winged Plovers, which are provided with a long and sharp spine on the point of the wing. Some Spur-winged Geese of Africa (*Plectropterus*) are similarly armed, as also are the Screamers of South America (*Chauna*). Many birds use their wings instead of their bills to defend

themselves, notably the Swans and Pigeons. The latter may have derived their fighting power with the wings from their ancient progenitors; such as the Solitaire mentioned above (p. 44). A blow from a Pigeon's wing is a pretty sharp one, and every one knows that the stroke of a Swan's wing is a matter not to be joked about. And yet so little do some of our great artists know about natural history that even Landseer was guilty of that dreadful impossibility of "Eagles attacking a Swanery," a picture beautifully painted, as goes without saying, but representing a fact which could not occur in nature. As was pointed out at the time of the exhibition of the picture, by that veteran ornithologist, Mr. W. B. Tegetmeier, so many Eagles would not be seen together—they would not attack with their bills, but with their talons; and lastly, they would think twice before touching a Swan, as a blow from the wing of the latter would probably disable a more powerful and courageous bird than either the Golden or White-tailed Eagle, which are the two species found in Britain. The Harpy Eagle of America (*Thrasaëtus harpyia*) might manage to kill a Swan, as he is said to be able to seize a cat fore and aft and pull it asunder, and a French naturalist told me that he once saw a Harpy in Mexico strike down a "Veal" (!), but no Eagle would try conclusions with a Swan, unless he were able to pounce on the latter when in full flight, and then the *talons* and not the *bill*, would do the work.

Although there are many birds which make playing-grounds and dancing-places in the breeding-season, the latter are too often utilized as arenas for fighting. There are, however, many birds which seem to love dancing for dancing's sake. The Cranes are great exponents of the art, as can be seen any day in the Zoological Gardens, and even the solemn Storks will occasionally indulge in a minuet. The following amusing account has been published by Mr. E. W. Nelson in his report on the Birds

of Alaska—"On May 18, I lay in a hunting blind, and was much amused by the performances of two Cranes, which alighted near by. The first-comer remained alone but a short time, when a second bird came along, uttering his loud note at short intervals, until he espied the bird on the ground, when he made a slight circuit, and dropped close by. Both birds then joined in a series of loud rolling cries in quick succession. Suddenly the new-comer, which appeared to be a male, wheeled his back towards the female and made a low bow, his head nearly touching the ground, and ending by a quick leap into the air. Another pirouette brought him facing his charmer, whom he greeted with a still deeper bow, his wings meanwhile hanging loosely by his side. She replied by an answering bow and hop, and then each tried to outdo the other in a series of spasmodic hops and starts, mixed with a set of comically grave and ceremonious bows. The pair stood for some moments bowing right and left, when their legs appeared to become envious of the large share taken in the performance by the neck, and then would ensue a series of skilled hops and skips, which are more like the steps of a burlesque minuet than anything else I can think of. Frequently others join, and the dance keeps up until all are exhausted."

The spirit of dancing exists too in other birds, and in none more than the Kagu (*Rhinochetus jubatus*) of New Caledonia, a curious species with grey colouration and a large crest, which may be considered to be a kind of Crane. A few specimens have reached Europe, and have been on view in our Zoological Gardens, where they have never failed to excite amusement by their curious antics. When the fancy for a dance enters into the soul of the Kagu, it whirls round and round in the aviary, and snatches at any piece of overhanging ivy which it meets with in its wild career.

Of the species living on the earth at the present day, no nearer ally of the Kagu can be found than the *Mesites* of Madagascar and the Sun-Bittern (*Eurypya nelias*) of South America. Of the *Mesites* nothing is known with regard to its habits, and as to whether it is a dancer or not, we are ignorant. The Sun-Bittern does not dance, but it goes through some extraordinary displays of its plumage, which is spangled all over, and is more like the colouring of a moth in pattern than like the feathering of a bird. There is, however, much in common with the dancing performance of one species, the "showing off" of another, and the playing-grounds and bowers which many birds construct. In fact there are few species which do not make more or less display during the breeding season, and there is nothing more amusing than to witness the love-making of a sober old Rook, as he walks round the female with his head bent down and crest erect, bowing to his wife with his wings expanded and tail spread, while he dances before her. I shall never forget the rude awakening which I once saw happen to a pair of love-sick Rooks on Salisbury plain. In the course of a tricycle journey to the west of England, my daughter and I were stopped at Amesbury by the breakdown of our tandem, but, as luck would have it, the Hawking Club happened that year to have made its head-quarters at the same hotel as ourselves, and the members were good enough to ask us to come and witness the exercise of the trained Peregrines. John Frost was then the Falconer to the Club, and we made most of the journey in the van in which the Hawks were hooded and seated on their perches, while the members of the Club were mounted on horseback, and were therefore able to follow the flights of the Peregrines much more rapidly than we were on foot. It was towards the end of the hawking season, and "Black Maria," as the van was called, seemed to be well known on the "Plain," for, as we

appeared, every Rook within a mile gathered itself together and took flight on the instant. At last on suddenly rounding a corner, we came upon a couple of silly old Rooks courting, about five hundred yards away. So engaged was the male in dancing round his wife and displaying his plumage, that we got closer still to the birds, before Frost slipped down behind the van and unhooded a female Peregrine. As the latter ringed her way aloft, no one could have supposed that she had any concern with the Rooks, who were now beating their way in the direction of the nearest wood, which was nearly a mile off. They had been surprised in the open country, where there were only a few scattered clumps of bushes. Meanwhile the Hawk had attained a considerable height, and then its attitude changed, and, like an arrow from a bow, it slid downwards towards the pair of Rooks, which also by that time had made considerable headway. Then came the *dénouement*, for the faithful pair, which had hitherto held together, separated when the Peregrine made its swoop. As Gilbert says—

"Love fled, and duty held its sway"

viz. the duty of self-preservation, and as the Hawk singled out one victim, the other took a cross-country route, and escaped without further molestation. A harder fight awaited the remaining Rook before he rejoined his mate, and the pair were able to compare notes in the evening. Beating along for his life, the Rook was fully exposed to the swoop of the Hawk, who descended upon him like a thunderbolt, only to be disappointed in her swoop, for at the right moment the cunning quarry gave a swerve, and the Peregrine shot by him at a terrific pace, mounting up into the air again and commencing at once to "ring" into the sky. Again the Peregrine made her swoop, and was again foiled, while after each narrow escape the poor Rook

flew for all he was worth, and at last took shelter in a bush, with the Hawk waiting in the air above for her quarry to be driven out. This was done with much shouting and cracking of whips, and when the Rook sallied forth again, the Hawk was ready for him and made a determined assault, which the Rook avoided as before, and then took refuge in another clump of bushes, each time getting nearer and nearer to the wood in which his mate had secured her retreat. The Rook was by this time frightened and exhausted and sat with his bill open, being very reluctant to take wing again. After a few minutes' rest, however, he once more flew into the open, and on the Hawk again missing her swoop, he beat bravely on, and gained the friendly shelter he had battled so courageously to reach. I am sorry to say that my daughter's appreciation of the courage of the Rook and her delight at the plucky escape of the latter did not meet with due response in the mind of the falconer, who said—"Yes, missie, but how about the poor Hawk?" The latter was, however, subsequently regaled with a meal off a Rook which she killed in splendid style a little later on in the afternoon, and one can only suppose that the old bird she had tackled unsuccessfully in the morning was endued with extra cunning, and was rather savage at the interruption to his courting-dance.

A curious instance of dancing-habits is observed in the "Jacana" (or "Jassana," as Mr. Hudson tells us we are to call the bird) of South America (*Jacana jacana*). This remarkable Wading-bird is one of half-a-dozen species which are found in the tropics of South America, Africa, India, and Australia. They are Plovers with the aspect of a Rail, and have enormously developed toes, with long sharp spurs on the latter. The South American Jacana is of a bright chestnut colour, with a black head and neck, with red lobes on the forehead, and, above all, with greenish-

yellow wings tipped with black, and ornamented with a yellow spur. This, however, albeit a formidable enough weapon to look at, is apparently never used as a means of offence or defence. On the contrary, it would seem to be but part of the ornamentation of the wings, which are apple-green in colour. This is a very rare tint to find in the plumage of a bird, and especially on the quills, but it is certainly looked upon as an ornamentation by the Jacanas, for they make a display of it. Mr. Hudson says that in the Argentine Republic he has seen these birds leave their feeding all in a moment, and, with quick excited notes, cluster together in a close group, and go through a singular and pretty performance, all together holding their wings outstretched and agitated, some with a rapid fluttering, others with a slow-moving, leisurely motion like that of a butterfly sunning itself. The performance over, the birds peaceably scatter again, and he has never seen Jacanas fighting.

Our next illustration (p. 259) gives a picture of two little Manakins (*Chiroxiphia linearis*), engaged in their dance. When travelling in Central America, Mr. C. C. Nutting came across this species in Nicaragua. He writes—"The natives call this bird the 'Bailador' or 'Dancer,' but it was not until I had been in the region for some time that I understood why it was called by that name. One day when hunting through the dense forest, the profound silence was suddenly broken by the regularly repeated note of 'El Bailador,' and softly making my way to the spot, I witnessed one of the most remarkable performances it has ever been my lot to see. Upon a bare twig which overhung the trail at a distance of about four feet from the ground, two male 'Bailadors' were engaged in a 'song and dance' act that simply astonished me. The two birds were about a foot and a half apart, and were alternately jumping about two feet in the air, and alighting exactly

upon the spot whence they jumped. The time was as regular as clock-work, one bird jumping up the instant the other alighted, each bird accompanying himself to the tune of *To-lé-do—to-lé-do—to-lé-do*, sounding the syllable *to* as he crouched to spring, *lé* while in the air, and *do* as he alighted. This performance was kept up without intermission for more than a minute, when the birds suddenly discovered that they had an audience, and made off."

Many sober-minded birds go through a ridiculous pantomime during the courting season, and no one would have suspected an apparently phlegmatic species like the Albatross to indulge in antics, yet Mr. Palmer says that, when he was in the island of Laysan in the Pacific Ocean, he saw the birds make love in the following manner—"First they stand face to face, then they begin nodding and bowing vigorously, then rub their bills together with a whistling cry. After this they begin shaking their heads and snapping their bills with marvellous rapidity, occasionally lifting one wing, straightening themselves out, and blowing out their breasts; then they put their bill under the wing or toss it in the air with a groaning scream, and walk round each other, often for fifteen minutes at a time."[1] The same observer also states that the red-tailed Tropic Bird (*Phaëton rubricanda*), a species which lays its eggs in holes, and flies through the air as if it was trying to imitate an express train, accompanies its love-making with some curious evolutions. As the male approaches the female, he swings his tail, which has the centre feathers elongated and of a red colour, from side to side and up and down, almost doubling it up under him, and this is continued for some time.

[1] Rothschild, 'Avifauna of Laysan,' p. 57.

Bailadors at play.

CHAPTER X

MIMICRY AND PROTECTIVE RESEMBLANCE IN COLOUR OF BIRDS

Female of *Papilio merope* (Fam. *Papilionidæ*).

Female of *Amauris niavius* (Fam. *Danaidæ*).

Mimicry in insects—Curassow and Caracara—Drongo and Black Cuckoo—Orioles and Helmeted Honey-eaters—Owl-Parrot—Thick-knees—Pennant-winged Nightjar—Argentine Little Bittern—Ptarmigan and Willow-Grouse.

A VERY interesting phenomenon in connection with the colouration of animals is that known as "mimicry." Lately it has become the fashion to speak of this as "unconscious" mimicry, by which I suppose it is intended to suggest that animals have not the power to change their appearance at will. No one would suppose that they had, but that many animals have changed in course of time, and have adopted

a kind of protective colouration, seems to be a reliable fact, even though one may not understand the circumstances under which these changes have become necessary for the preservation of the species. The examples of mimicry in insects with which I was wont to illustrate my lectures were supplied to me by my friend and colleague, Mr. Charles Owen Waterhouse, of the British Museum, and they were chosen as being perhaps more easy to understand than the examples of bird-mimicry which followed. In the Amazons there is a tiny moth (*Pompiliopsis tarsalis*), which "mimics" a little wasp of the same regions (*Agenia*), and here the advantage of the protective resemblance is plain. Every one knows what a Clothes'-moth is, an unfortunate little creature which one abominates, and seizes with the fingers or crushes with the hands. In the case of a wasp one thinks twice before touching it, and Du Maurier long ago hit off the situation in 'Punch,' when he pictured a little maiden relating to her mother how a pretty wasp, with yellow and black bands on its body, settled on her arm and ran along. "But, oh, mamma dear, *when it sat down!*" So perhaps a bird on the Amazons thinks twice before it seizes the supposed wasp, which might *sit down* on its tongue or in its eye. Thus does the little moth score by being mistaken for the wasp.

In Madagascar lives a butterfly, *Papilio meriones*, a fine yellow species with black markings, *with the sexes alike in colour*. On the continent of Africa a similar species is met with, *P. merope*, and the male is again yellow and black as in the Madagascar form, but the female is totally different, and is a thorough "mimic" of a Danaid Butterfly belonging to the genus *Amauris*, a member of a totally different family of Butterflies, viz. the *Danaidæ* (see figs. on p. 261). Bearing in mind the fact that "mimicry," wherever we find it, serves as a protection to the more helpless animal, we see the advantage gained by the female *Papilio*, which is quite

nice to eat, and a dainty morsel for any bird, if the latter comes to mistake it for an *Amauris*, which, like other *Danaidæ*, is a creature no self-respecting bird would think of touching, for both the odour and the taste of these butterflies is sufficient to warn birds off. Many females of the species of *Hypolimnas*, a harmless butterfly, mimic other species of *Danaidæ*, and can scarcely be distinguished as regards the pattern of their markings from members of the genus *Limnas*, which is a Danaid genus.

So-called "mimicry" in birds is not so often in evidence, but it exists nevertheless, and where it occurs, it is always apparently to the advantage of the weaker or more astute species. One very good instance is seen in the resemblance of the American Caracara or Curassow-Hawk (*Ibycter americanus*) to a Curassow (*Ortalis*) in Central America. The former is a carrion-eating Hawk, of loathsome habits and aspect. The Curassow, on the other hand, is a Game-bird and good to eat, and one can understand the feelings of a keen naturalist, like the late George Cavendish Taylor, when he was travelling in Honduras. "While at Tanlevi," he writes, "I was out in the evening with my gun, and was returning home with a male of the Black-headed Trogon which I had shot, when I met Mr. E——, who pointed out to me some large birds sitting on a tree overhanging a plantain-patch, which he said were Curassows. There were five of them; and they certainly did look like Curassows in flight and general appearance. The plantain-patch was thickly overgrown with long grass and reeds, but on I went, regardless of probable snakes and certain swarms of "agarrapatas," although I had been particularly careful all day not to go where I was likely to carry off any of the latter. As for the Trogon, I threw it away in contempt, having so much finer game in view. The Curassows, I considered, would amply repay me for a

sleepless night, endless scratchings, and consequent sores. So I stalked up to them and shot one, while the others flew off to a not very distant tree. From their flight, cries, and general appearance, I still thought they were Curassows. The bird I had killed fell into a dense thicket, across a stream. Could I only have got at it, I should have been spared additional agarrapatas and disappointment! However, not stopping to pick up the dead one, I followed the others across the plantain-patch, then forced my way through an aloe-fence, which presented a perfect *chevaux de frise* of spikes, and succeeded in shooting three birds out of the remaining four. I now felt proud of what I had done, and of how well I had provided for our pot, which was in want of supplies at the time. E——, who had been watching me, went to pick the birds up. As he took hold of the first, he said, 'This is a Hawk!'—and Hawks they all were, sure enough, to my great disgust and disappointment. When dead, they still resembled Curassows, but they were Hawks nevertheless—nothing but great, black, stinking, red-legged Hawks. However, I was not disappointed in agarrapatas, for I went home well stocked with them, and in no pleasant humour at having little or nothing to repay me for the discomfort I had to undergo."

Here it is evidently to the advantage of the Caracara (except when he gets shot in error, as related above) to be mistaken for the peaceful Curassow, as he is able to sit like the latter in a tree and capture any prey which chooses to settle near the supposed Game-bird, in the quiet assurance that a Curassow would do it no harm.

The same "mimicry" is observable in the Cuckoos, especially in the genus *Hierococcyx*, the Hawk-Cuckoos, of India and Africa. These birds are so called on account of their wonderful resemblance to a Sparrow-hawk (*Accipiter*).

The likeness is truly remarkable—grey colour above—rufous bands on breast—yellow eye—banded tail—and bars on the latter. To complete the similitude the Cuckoo has large overhanging feathers on the thigh, just as in a Sparrow-hawk. Our common Cuckoo (*Cuculus canorus*) also so closely resembles the Sparrow-hawk in appearance and still more in flight, that small birds mob both of them impartially, and the appearance of a Hawk or a Cuckoo is the signal for every Swallow and Martin in the neighbourhood to join in the assault, unheeded in the case of the Cuckoo, but sometimes resented, and with fatal effect to one of its assailants, by the Sparrow-hawk. To an unpractised eye it is difficult to distinguish the latter from a Cuckoo in full flight, and the small birds seem to be unable to tell the one from the other, unless it be that their instinct leads them to regard both as their natural enemies, and to attack them equally on that account.

An exact copy of a large crested Hawk-eagle (*Spizaëtus ornatus*) exists in some South American countries in a Goshawk (*Astur pectoralis*), but whereas the latter is one of the rarest of Accipitrine birds in collections, the Hawk-Eagle is comparatively a common bird. Again, in the Island of Celebes in the Moluccas, a Honey-Kite (*Pernis celebensis*), a comparatively harmless insect-eating species, is an exact mimic of the Crested Hawk-Eagle of the island (*Spizaëtus lanceolatus*), and this not only in the adult but also in the young stages of plumage. In Borneo, the dark form of the Honey-Buzzard of the country (*Pernis ptilonorhynchus*) is almost an exact copy of the Hawk-Eagle (*Spizaëtus alboniger*) which inhabits the same districts. Thus one may ask whether, in these instances of apparent "mimicry" between species inhabiting the same tropical areas, it may not have been induced by a combination of circumstances in their surroundings, which may have resulted in a similar change of plumage being adopted

by degrees, as it is difficult to understand where any advantage from "mimicry" in any of these species can be detected. Another instance of the same phenomenon in South American Hawks is seen in the case of *Accipiter pileatus* and *Harpagus diodon*, which belong to different sections of the *Accipitres*, the *Accipiter* being a large Sparrow-hawk and the *Harpagus* a soft-plumaged Kite-Falcon. The species of the genus *Harpagus* have a double tooth in the bill and are insectivorous and tolerably harmless for birds of prey, and here the advantage must be on the side of the more fiery Sparrow-hawk, if the latter, by reason of the similarity of its plumage, which extends to the young birds also, is mistaken for the more harmless *Harpagus*, and is therefore approached more closely by the small birds which it preys upon, a mistake only discovered when too late by its victims.

Perhaps, however, the most wonderful instance of mimicry in birds is the one brought to notice by Dr. A. R. Wallace, who pointed out that, in certain of the Molucca Islands, there exist, side by side, an Oriole (*Mimeta*) and a Helmeted Honey-eater (*Philemon*), which are exact copies of each other. Thus in the island of Bourou, *Mimeta bourouensis* and *Philemon bourouensis* are exactly alike in plumage, and in Ceram we find a similar instance in *Mimeta forsteni* and *Philemon subcornutus*.

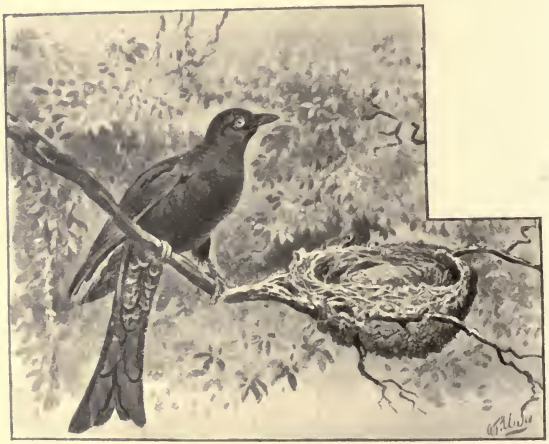
When Dr. H. O. Forbes visited the Tenimber Islands, he also discovered there the usual Oriole in *Mimeta decipiens*, and its double, *Philemon plumigenis*. The resemblance in these birds, which belong to such widely different families as the *Oriolidæ*, with their horny, Thrush-like tongue, and the *Meliphagidæ*, which always have a feathered or brush-like tongue, is certainly very remarkable, and it is carried out to the letter, the dark bare space round the eyes of the *Philemon* being reproduced by darkened feathers in the *Mimeta*, while even the little whitish eyebrow is common to

both species. It may further be remarked as a wonderful coincidence that, just as the plumage of the *Mimeta* from Bourou differs from the *Mimeta* of Ceram or Timor Laut, even so does the *Philemon* of each island differ in the same degree, mimicking in every case the specific characters which have served to separate the different insular forms of *Mimeta*. Professor Newton thinks that the advantage lies on the side of the Oriole, which is "comparatively a weak bird, and must benefit by being mistaken for the strong, pugnacious, and noisy *Philemon*, two or three of which will drive away Crows and even Hawks, that venture to perch on a tree they have occupied."

The latter author likewise draws attention to a wonderful case of "mimicry" in two birds from Madagascar. One is a *Tylas*, belonging to the harmless group of Bulbuls (*Pycnonotidæ*) and is an exact copy of a *Xenopirostris*, which is a genus of Shrikes (*Laniidæ*). Thus *Tylas eduardi* and *Xenopirostris polleni* are both alike in colour, and the Bulbul doubtless benefits by being mistaken for the fiercer and more energetic Shrike. Yet, as Professor Newton points out, the two birds are alike "feather for feather," and the difference in the colour of the under surface of *T. eduardi*, which is sometimes buff and sometimes white below, is faithfully represented in the *Xenopirostris*, which the Bulbul "mimics."

Then there is the case of the Black Drongo (*Buchanga atra*) of India, and the Black Cuckoo (*Surniculus lugubris*) which is found in the same country. These birds are black, and of the same size, have red eyes, a forked tail, and white bands across the under tail-coverts. The only difference to be found in their external appearance is in the long thigh-feathers which are to be seen in the Cuckoo, but not in the Drongo, and, of course, the Cuckoo has a zygodactyle foot, with two toes in front and two behind, while the Drongo has a Passerine foot, with three toes in front and one behind.

Here one can imagine how the Cuckoo profits by the similitude of its colouration to that of the Drongo. The latter is not unlike a Shrike in its habits, and is a vigorous and fierce bird, resenting the appearance of any intruder in the vicinity of its nest. I have myself seen a pair of these



The Black Cuckoo (*Surniculus lugubris*) near the nest of the Drongo.

birds in India mount into the air and buffet a Crow (*Corone levaillanti*) six times their size and drive him off from the neighbourhood of their habitation, pursuing him for a long distance from their hunting-ground. A weak bird like a Cuckoo would have no chance with these persistent little fighters, and yet it is imperative for the Black Cuckoo to get to the nest of the Black Drongo, if, as has been said, it is parasitic on the latter. The eggs of the Drongo are white or pinkish, with rufous or black spots, principally

distributed round the larger end of the egg, and with underlying grey spots as distinctly indicated as the darker ones. The eggs of the Cuckoo have not been described, but they will doubtless be found to resemble those of the Drongo, for a pair of the latter have been seen by Davison to feed a young *Surniculus*. Thus the eggs of the two birds are probably very similar, and here is where the "mimicry" in the plumage would come in. If the Cuckoo were red or white or of bright colours, the Drongos would never allow it to come within hail of their nest. Of the Black Drongo Mr. A. O. Hume writes—"These birds are very jealous of the approach of other birds, even of their own species, to a nest in which they have eggs, and many a little family of theirs would have been safely reared this year (1873), and their ovate cradles have escaped the plundering hands of any Shikarees, had not the attention of the latter been invariably called to the whereabouts of the nest by the pertinacious and vicious rushes of one or the other of the parents at every feathered thing that passed near their nest." It would only be, therefore, to a Drongo-like bird that a chance of approaching the nest at all would be possible, and even this must be difficult, as Mr. Hume expressly states that the owners of a nest are jealous of the intrusion even of one of their own kind into their dominion. The Black Cuckoo, from the absolute similarity of its plumage to that of the Drongo, might at least be mistaken by the husband for his wife, or *vice versâ*, if it succeeded in

The Black Drongo (*Buchanga atra*).

perching near the nest while the parent-birds were away foraging, and then the Cuckoo would find its opportunity to drop its egg into the Drongo's nest. Other Indian Cuckoos like the Black Crested Cuckoo (*Coccystes jacobinus*) and the Red-winged Crested Cuckoo (*C. coromandus*) lay blue eggs, and are parasitic on Babbling-Thrushes, which also lay eggs of the same colour.

The protective colouring of certain birds acts in a different way to the protective "mimicry" to which I have just alluded. There are many weak and helpless birds which owe their preservation in the battle of life to the resemblance which their plumage exhibits to their normal surroundings. Of this phenomenon a wonderful example is afforded by the Kakapo or Owl-Parrot (*Stringops habroptilus*) of New Zealand. This is a large flightless bird, with a heavy body, clothed in grass-green plumage. The wings are quite large, and at first sight would appear perfectly capable of carrying their owner through the air, as no doubt they did in past times, but now this power has been lost, and with it has followed the disappearance of the keel of its breastbone. There is no longer any necessity for its presence to increase the support for the attachment of the pectoral muscles, upon which the flight of a bird so largely depends. As regards the form of the sternum in the Owl-Parrot it is almost as thoroughly "ratite" as that of any Struthious bird. It lives in New Zealand, side by side with the flightless *Apteryx* and Giant Gallinule (*Notornis*). The allies of the latter bird are the Purple Gallinules (*Porphyrio*), which are found distributed at the present day over the tropical portions of both hemispheres, and they are birds which fly very fairly, considering that they belong to the skulking family of the Rails (*Rallidæ*). Of the volant progenitors of the flightless *Apteryx*, we have as yet no trace, but the Parrots are birds of remarkable powers of flight, and in this family it is as an anomaly to meet with

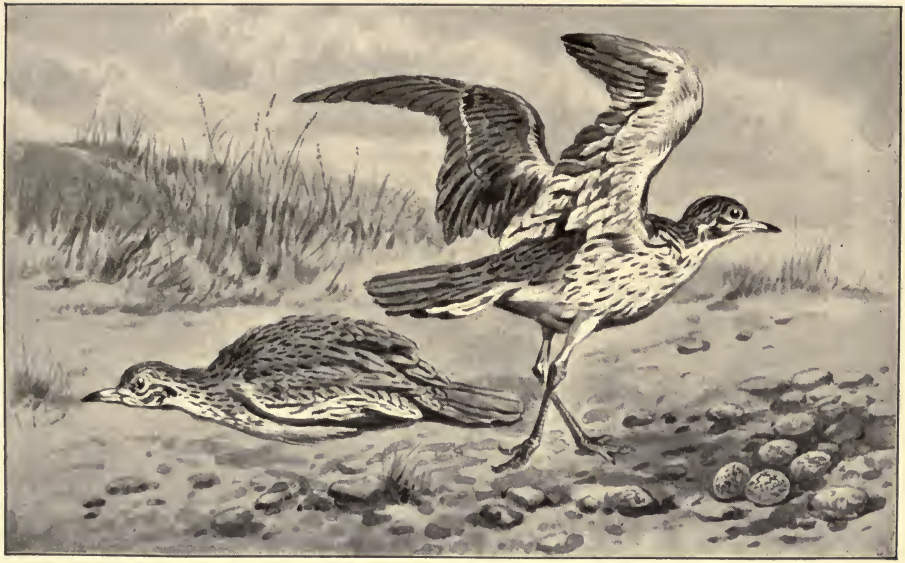
a flightless species like the *Stringops*. As with the other non-volant New Zealand birds, abundance of food within easy reach and the absence of carnivorous animals and birds of prey in past ages, has doubtless rendered escape by flight unnecessary, and so the use of the wings has gradually declined, until at last the birds have lost the power of flight

The Owl-Parrot (*Stringops habroptilus*).

altogether. In the case of the Owl-Parrot, however, another means of escape from danger is to hand, in its grass-green plumage, which forms a protective resemblance to its natural surroundings, so that, if forced to quit its hiding-place in the day-time, it is able to escape observation simply by remaining perfectly quiet in the midst of the green moss, which clothes the country where it is found, and to which

its plumage closely assimilates. When pursued by a dog or other enemy, the "Kakapo" does not attempt to use its wings, but will drop like a stone on to the rocks below, and if surprised in the open, it seeks safety by running away like a Fowl, merely opening its wings slightly, but never attempting to fly with them.

On the downs of the South of England and on Salisbury Plain, as well as in some other wild and open places in East Anglia, is found every summer a bird called the Thick-knee (*Œdicnemus œdicnemus*). It is also known as the Stone-Plover and Norfolk Plover. This bird is somewhat Bustard-like in its ways, frequenting the open country, and is remarkable for the very large size of its eye, which is of a bright yellow colour. The Thick-knees are found in the barren and desert portions of the Old World, as well as in Central and South America, and eight different species are known. They are extremely shy birds, and their eggs are difficult to find, as they are laid without any nest, on the bare ground, and closely resemble the stones which lie scattered around. The old birds, on the approach of danger, throw themselves down on the ground and extend their necks, so that they escape observation from any passing Bird of Prey, and this instinct is also observable in the tiny nestlings. It is, however, amusing to see the way in which the Thick-knees put in practice this "protective resemblance" under certain circumstances. I had a pair of these birds which I kept loose in my garden during the day, but at night they were turned into an aviary. After they had been in confinement some time, they became fairly tame, and would use every artifice in their power to try and escape being interned in the evening. Their device, when all other concealment failed, and they had been routed out of their hiding-places, was to prostrate themselves on the ground and lie perfectly still—a manœuvre which might have been successful on fallow



The Stone-Plover, or Thick-knee (*Œdicnemus œdicnemus*).

land, but which signally failed to hide them, when executed in the middle of a lawn.

Another species which apparently uses its decorative wing-feathers for the purposes of escaping detection is the Pennant-winged Nightjar (*Macrodipteryx longipennis*), which has an ornamental shaft-like plume with a large feathery racket. This species is found in West Africa and the Soudan, and is an ordinary-looking Nightjar but for the fact that, in the breeding-season, it carries a long wire-like streamer on each wing. The ninth primary (not the second, as Professor Newton says) is developed to an enormous length, and floats behind the bird on each side with a broad feathery tip at the end of it. That it is a sexual ornament of the male I have but little doubt, but another use for this curious appendage has been suggested by the figure of the species given in Professor Newton's 'Dictionary of Birds' (p. 641), where the bird is represented as sitting on the ground with its streamers elevated, so that they look like grass-stems. This peculiar feature in the bird's life was observed by the late Mr. Joseph Gedge, who accompanied Sir Samuel Baker's expedition to the Soudan, and made a sketch of the Nightjar in this position. It is quite possible that the bird, which, like all of its kind, has such a mottled plumage that it is impossible to detect it on the ground, might risk observation from an enemy if its long streamers lay out upon the sand, and it may therefore adopt the above method of self-preservation; but it must be a great effort to the bird to erect its primaries in this manner, as I find that in the specimen I have mounted in the Bird Gallery of the Natural History Museum, in the position sketched by Mr. Gedge, the pennants cannot be kept in their erect position, and the bird must certainly have great difficulty in maintaining its two pennants aloft. It will be extremely interesting some day to examine the

muscular arrangement by which this extraordinary effort at "protective resemblance" is achieved.

The Pennant-winged Nightjar (*Macrodipteryx longipennis*), from a specimen in the British Museum.

Perhaps the most wonderful of all the stories told about the protective colouring of birds is that related by Mr. W. H. Hudson of the Little Bittern of Argentina (*Ardetta involucris*). The genus *Ardetta* contains nine species, which are distributed over the temperate and tropical portions of the Old and New Worlds. Of the Little Bittern of Europe, *Ardetta minuta*, it has often been recorded that, on the approach of danger, it will stiffen itself in an instant, and draw all its plumage close together, so that it resembles a reed or a branch, completing the likeness by throwing its head into the air, and remaining perfectly motionless. The same habit may even be observed in the Common Bittern (*Botaurus stellaris*) in our Zoological Gardens. This is a large bird with a handsome frill on each side of the neck, but the general colour is a freckled brown, while the under surface has a good deal of yellow or straw-colour in its composition, so that one can well imagine that in a thicket of rushes, such as all Bitterns love to frequent, its resemblance to a dead rush, which it does its best to imitate, must be a wonderful protection to the bird when danger surprises it. In a menagerie, however, when it stands like a rush with a background of dark evergreen bushes, the effect is not so convincing, but even then the bird goes through its performance as if it were in the midst of its protecting reed-bed, and as the observer moves to one side of it or the other, the Bittern will turn his rush-coloured breast towards him as if nothing should make him show his blackish head and darker-coloured upper plumage.

The performance of the little Argentine Bittern must be told in Mr. Hudson's own words—"When driven up, the bird flies eighty or a hundred yards away, and drops again amongst the rushes; it is difficult to flush it a second time, and a third time it is impossible. A curious circumstance is that where it finally settles it can never be found. As I

could never succeed in getting specimens when I wanted them, I once employed some Gaucho boys, who had dogs trained to hunt young Ducks, to try for this little Heron. They procured several specimens, and said that without the aid of their dogs they could never succeed in finding the bird, though they always marked the exact spot where it alighted. This I attributed to the slender figure it makes, and to the colour of the plumage so closely assimilating to that of the dead yellow and brown-spotted rushes always found amongst the green ones; but I did not know for many years that the bird possessed a marvellous instinct that made its peculiar conformation and imitative colour far more advantageous than they could be of themselves."

"One day in November 1870, when out shooting, I noticed one of these Herons stealing off quickly through a bed of rushes, thirty or forty yards from me; he was a foot or so above the ground, and went so rapidly, that he appeared to glide through the rushes without touching them. I fired, but afterwards ascertained that in my hurry I missed my aim. The bird, however, disappeared at the report; and thinking I had killed him, I went to the spot. It was an isolated bed of rushes I had seen him in; the mud below and for some distance round was quite bare and hard, so that it would have been impossible for the bird to escape without being perceived; and yet, dead or alive, he was not to be found. After vainly searching and re-searching through the rushes for a quarter of an hour I gave over the quest in great disgust and bewilderment, and after reloading was just turning to go, when behold! there stood my Heron on a reed, no more than eight inches from me, and on a level with my knees. He was perched, the body erect, and the point of the tail touching the reed grasped by its feet; the long, slender, tapering neck was held stiff, straight, and vertically; and the head and beak,

instead of being carried obliquely, were also pointing up. There was not, from his feet to the tip of his beak, a perceptible curve or inequality, but the whole was the figure, the exact counterpart, of a straight tapering rush, the loose plumage arranged to fill inequalities, and the wings pressed into the hollow sides, making it impossible to see where the

The Argentine Little Bittern (*Ardetta involucris*).

body ended and the neck began, or to distinguish head from neck or beak from head. This was, of course, a front view; and the entire under surface of the bird was thus displayed, all of a uniform dull yellow, like that of a faded rush. I regarded the bird wonderingly for some time; but not the least motion did it make. I thought it was wounded or paralyzed with fear, and, placing my hand on the point of

its beak, forced the head down till it touched the back; when I withdrew my hand, up flew the head, like a steel spring, to its first position. I repeated the experiment many times with the same result, the very eyes of the bird appearing all the time rigid and unwinking, like those of a creature in a fit. What wonder that it is so difficult, almost impossible, to discover the bird in such an attitude! But how happened it that while repeatedly walking round the bird through the rushes I had not caught sight of the striped back and the broad dark-coloured sides? I asked myself this question, and stepped round to get a side view, when, *mirabile dictu*, I could see nothing but the rush-like front of the bird! His motions on the perch, as he turned slowly or quickly round, still keeping the edge of the blade-like body before me, corresponded so exactly with my own that I almost doubted that I had moved at all. No sooner had I seen the finishing part of this marvellous instinct of self-preservation (this last act making the whole complete), than such a degree of delight and admiration possessed me as I have never before experienced during my researches, much as I have conversed with wild animals in the wilderness, and many and perfect as are the instances of adaptation I have witnessed. I could never finish admiring, and thought that I never had anything so beautiful fallen in my way before; for even the sublime cloud-seeking instinct of the White Egret and the typical Herons seemed less admirable than this; and for some time I continued experimenting, pressing down the bird's head and trying to bend him by main force into some other position, but the strange rigidity remained unrelaxed, the fixed attitude unchanged. I also found, as I walked round him, that as soon as I got to the opposite side and he could no longer twist himself on his perch, he whirled his body with great rapidity the other way, instantly presenting the same front as before. Finally I plucked him forcibly from the rush

The Hoopoe (*Upupa epops*).

and perched him on my hand, upon which he flew only fifty or sixty yards off, and dropped into the dry grass. Here he again put in practice the same instinct so ably that I groped about for ten or twelve minutes before refinding him, and was astonished that a creature to all appearance so weak and frail should have strength and endurance

Little Bittern in reed-bed.

sufficient to keep its body rigid and in one attitude for so long a time."

An interesting corollary to this story was told me by my friend, Mr. F. V. McConnell, who has explored with Mr. J. J. Quelch, the well-known Director of the Museum at Georgetown in British Guiana, the slopes of Roraima and the savannahs of the interior of the country. On a recent

expedition they procured a specimen of a Little Bittern of a kind hitherto unknown in Guiana, and the specimen when brought to England, turned out to belong to the Argentine Little Bittern (*Ardetta involucris*), a species up to that time believed to be only an inhabitant of Southern Brazil and the Argentine Republic. As it was entirely new, not only to Mr. Quelch, but also to the Fauna of British Guiana, the wounded bird was retrieved, and having been despatched in the orthodox manner by compressing its breast, was laid out apparently lifeless in the skinning-room, for the taxidermist to prepare. The bird had, however, only been shamming death, for on the man entering the room to prepare the specimen, the latter had disappeared from the table on which it had deen deposited. A hunt for the *rara avis* was for some time ineffectual, till at last it was discovered standing in its normal attitude of concealment against the leg of a table, close to which it had crept. Apparently thinking that the table afforded the nearest approach to a reed within its hail, it had tried to hide itself by doing its best to resemble the table-leg as nearly as it could.

The Common Hoopoe (*Upupa epops*) of Europe makes use of its protective plumage in a totally different way, but with the same object in view, viz. to escape danger, when flight will not serve its purpose. Although the Hoopoe nests in Central Europe, it is not a common bird, and it is much more plentiful in the Mediterranean countries and sandy districts of Africa and Asia. For such a delicate and natty-looking bird, it is remarkable that its nesting habits are of the filthiest, and the name of "Stink-bird" and other opprobrious epithets are bestowed on it in Germany on account of the dirty condition in which it keeps its nest, which, towards the end of the season, before the young have flown, is often nothing but a seething mass of maggots. When seen in the open, however, the Hoopoe is a most

Ptarmigan in summer plumage.

graceful little bird and struts about with great dignity, raising and depressing its crest, and bowing at each utterance of its call-note "houp-houp." On the plains of India I have seen a little party of these birds rise from the ground together, when they look like a lot of large Butterflies, with their black-and-white-banded wings, so that one could readily imagine that they could be detected a mile off. That this constitutes a danger for the species is undoubted, for by reason of its conspicuous appearance the Hoopoe is easily perceived at a long distance, and it would thus fall an easy prey to a Hawk, as its powers of flight are somewhat limited. As a matter of fact, many Hoopoes do fall victims to the attacks of Birds of Prey, and doubtless many more would be thus captured, but for a very singular method of protection possessed by the bird. When danger is imminent, the Hoopoe simply throws itself on the ground, sticks its bill out straight, so that the crest is flattened along the back, spreads out its wings and tail, and looks so like a bundle of rags "that the spoiler passes over, none the wiser." Dr. A. E. Brehm, who records this feature in the bird's economy has the following note on the species—"A family of Hoopoes affords a very pretty spectacle, old and young vying with each other in the comicality of their postures and gesticulations. Each insect that the old birds capture with their long forceps-like bill, is thrown up into the air and caught again in the gape, because without this manœuvre they are totally unable to swallow their prey. Before the old bird has been able to do this, the whole tribe of youngsters rush up and seek to snatch away the morsel. They are, however, too clumsy as yet to succeed. This little exhibition is amusing in the extreme, and the more so if a Hawk or other Bird of Prey arrives on the scene, when a sudden outcry is raised, and one and all have resort in the greatest haste to the old trick, and in an instant half-a-dozen coloured rags are

apparently lying on the ground."[1] The fact of the young birds possessing this instinct of self-preservation, vouched for by such an observer as Alfred Brehm, is a most interesting one, and Mr. J. G. Keulemans, the great natural history artist, assures me that he has witnessed the same thing himself. On one occasion he saw a party of Hoopoes routing about the roots of an old tree in a gravel-pit, and on their being startled, every bird seemed to disappear as if by magic, although not one of them flew away. They had simply made themselves invisible on the gravel in the way mentioned above, and this manœuvre must be greatly aided in sandy localities by the sandy colour of the bird's body. The way in which animals of the desert resemble their surroundings is well known, and a most instructive case representing this phenomenon is to be seen in the Great Hall of the Natural History Museum. There is exhibited a square yard of actual desert from Cairo, with the animals which frequent it, and the student can see that not only the birds, but the small Jerboas and Mice, as well as the Lizards and Snakes, are all of a desert-colour. It stands to reason that, if they were not thus light-coloured, they would be detected by their enemies with great ease, and hence the advantage of protective colouration.

Another instance of this phenomenon in a northern form of bird-life is afforded by the Ptarmigan (*Lagopus mutus*) and the Willow Grouse (*L. lagopus*), which undergo three changes of plumage in the course of the year, and these changes are performed by male and female alike. They are, moreover, necessary for the preservation of the species in the countries inhabited by the birds, for were the Ptarmigan or the "Ryper" to maintain their dark plumage through the winter when snow covers everything, they would at once be detected, and the same would be the case if they remained white throughout the summer, when the

[1] 'Bird Life,' p. 623.

Ptarmigan in autumn plumage.

snow melts and the general aspect of the country is dark, so that a white object would be easily perceived. In autumn when the aspect of the country is greyer, and the green of summer disappears, while the mosses of the grey mountains become conspicuous, there also would the Ptarmigan or the "Ryper" be seen at once, if the dark plumage of summer were retained, or the white plumage of winter were donned before the snow began to fall. Thus the grey autumn plumage of these Grouse corresponds to the aspect of the country, just as the liveries of spring and winter also assimilate to the surroundings of the birds at those seasons of the year.

The changes of plumage undergone by our Red Grouse (*Lagopus scoticus*), which is an insular form of the Willow Grouse, do not correspond with those undergone by the latter species, but the Ptarmigan, which inhabits higher grounds, changes on the mountains of Scotland exactly in the same way as it does in Norway. Accustomed in the course of ages to a milder climate than that in which the Ryper has to exist, our Red Grouse has lost the necessity for turning white in winter, and the female has no distinct winter dress, though she moults in summer and again in autumn. The male, however, moults in autumn and winter, and retains the latter plumage until the following autumn, his winter dress thus remaining throughout the breeding season. Mr. Ogilvie Grant, to whose careful studies of the species the above-mentioned curious facts of the seasonal liveries of the Red Grouse have been due, says that "the great peculiarity in the species, and one without parallel even in the group of Willow Grouse, lies in the fact that the changes of plumage in the male and female occur at different seasons. The male has no distinct summer plumage, but has distinct autumn and winter plumages, and retains the latter throughout the breeding-season. The female has a distinct summer plumage,

which is complete by the end of April or the beginning of May; also a distinct autumn plumage, which is retained until the following spring. To put it more concisely, both male and female have two distinct moults during the year, but in the male they occur in the autumn and winter, and in the female in summer and autumn; the former having no distinct winter plumage. In the Willow Grouse and Ptarmigan there are three distinct changes of plumage in summer, autumn, and winter, in both male and female alike, the winter plumage being white in all."[1]

My friend Nicolai Hanson tells me that he was once witness to a curious performance in the Willow Grouse in Norway. These birds seek out the places where the snow has begun to melt, and are often to be found in small packs where the snow lies thinnest. On one occasion he had climbed a mountain in pursuit of Ryper, and peeped cautiously over a ridge, when he saw several of these birds under a ledge on the other side, where the snow had either not fallen, or had melted away. Directly the birds perceived him, they did not fly away, but commenced to dust vigorously in the earth, and to throw the latter over their backs, apparently with the intention of rendering their white plumage invisible. The birds he shot out of the flock had their white backs quite soiled with earth.

[1] 'Handbook to the Game-Birds,' i. p. 28.

Ptarmigan in winter plumage.

CHAPTER XI

PARASITIC BIRDS

The Ani of Jamaica (*Crotophaga ani*).

The Koel and the Myna—The Common Cuckoo—Its Migration and winter home—The similarity of its eggs to those of the foster-parent—The ejection of the young of the latter—The Cow-birds parasitic on each other—The nesting of the Ani or Savana Cuckoo of Jamaica.

ONE of the most wonderful facts in connection with protective colouration of birds was brought to light by Mr. John Whitehead, when he was travelling in the island of Palawan in the Philippines. To understand this phenomenon rightly, one must remember that a general rule of colouration runs throughout the majority of the class *Aves*. Thus, when

the father and mother are alike, the young birds are not very dissimilar from both the parents, or else they are quite unlike the latter. Examples are to be seen in many of our familiar species, such as the Crows, Jackdaws and Magpies, where there is but little difference between the plumages of the old and young birds. In our Song-Thrush, where the sexes are alike in plumage, the young birds are spotted, but are otherwise not very different from their parents, and in many other birds like the Finches, where the male and female are often different in colour, the young are spotted, and do not have a plumage like that of either the father or mother. In the Nightingale and the Robin, where both parents are coloured alike, the young are quite different and are profusely spotted, and so it is with the Common Fly-catcher; but the Redstart has the same kind of spotted nestling, though there is a great difference between the colour of the male and female, and the latter is much the plainer of the two. In these cases we find the character of a spotted youngster to be an essential one, for it runs throughout the whole family of *Turdidæ* or Thrushes, and is the first point we look for to find out whether a bird is a Thrush or a Warbler. After the first moult, there is scarcely any difference in the colour of the young and old birds.

It is seldom that the young are more highly coloured than the adults, but in the Great Spotted Woodpecker (*Dendrocopus major*) the young birds, both male and female, have the whole of the crown crimson, whereas, after they have moulted into adult plumage, the head of the female is black, while the male has also a black head, with only a patch of crimson on the nape.

The young birds of our Long-tailed Tit (*Ægithalus vagans*) and those of the Fan-tail Warblers (*Cisticola*) have longer tails than their parents, and appear to be larger than the latter.

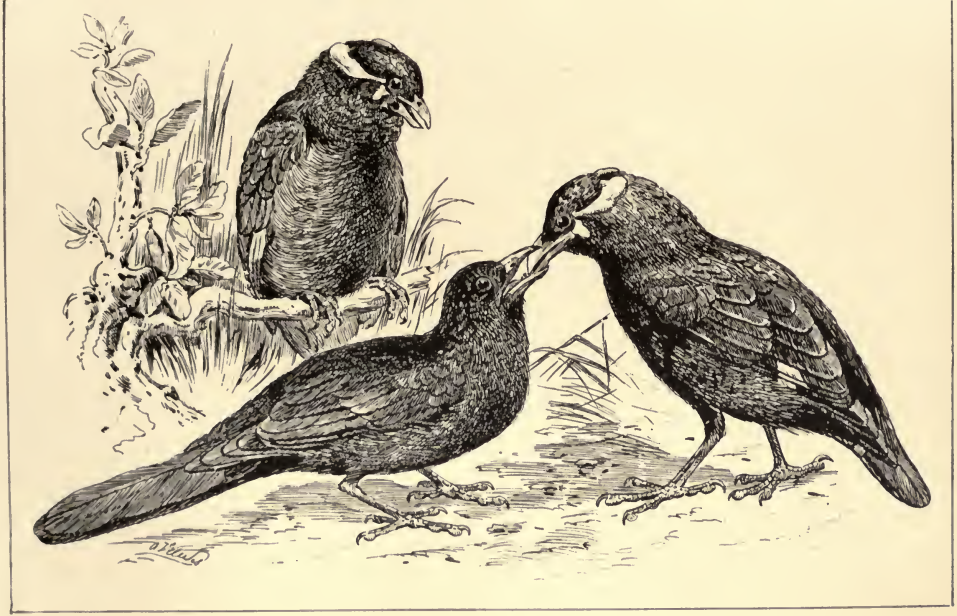
In Birds of Prey there is a good deal of variation in the colour of the young birds as compared with that of the old ones. Many Eagles do not greatly differ in this respect, and often the colouring and barring of the tail is our only guide to the determination of the age of the birds. Young Kestrels of both sexes resemble the mother rather than the father, but we find exceptions in many cases, as in some of the Harriers, where the young birds are different in colour and markings from both their parents, though they resemble the old hen to a certain extent, in being brown instead of grey like the male. In Buzzards, Hawks, Serpent-Eagles, and Falcons, where the only differential character between the old birds is one of size, the young plumages are quite of another pattern, and do not resemble those of either father or mother.

In many cases where the parent birds are absolutely unlike each other, the young have more likeness to the plumage of the mother than that of the father. Take, for instance, the familiar case of our Common Blackbird (*Merula merula*), where the male is perfectly black, and the female is dark brown. The nestlings are much more like the old hen than the cock, and it is not until after the first moult that the sexes of the young birds can with certainty be determined by the colour of the plumage alone. Thus we are enabled to understand how remarkable is the case of the Koel of Palawan referred to above. The Koels are Cuckoos of the genus *Eudynamis*, which are sufficiently plentiful in India and the Malayan countries and islands. They have a peculiarly exasperating whistle, a sort of *pi—u pi—u*, which the bird keeps on uttering incessantly in an ascending scale, beginning at the bottom again as soon as it has reached the topmost notes. I was introduced to the Koel in the plains of India, and one of my friends called it the "brain-fever bird," as it is said to produce an attack of brain-fever, if an unfortunate man

happens to be ill and confined to his bed, when the Koel keeps up his irritating song all day in the compound.

The male Koel is entirely black, but the female is quite differently coloured, being black above and whitish or rufous below, with bars of rufous or spots of white on the back, and streaks and bars of black on the under surface. Hence it can be seen at once that she is in every way different from her black mate in colour.

The majority of Cuckoos have young which do not differ materially from the adults in their colouration. Our own *Cuculus canorus* is an exception, like the rest of the true Cuckoos, inasmuch as the young bird is absolutely different in pattern of plumage from the adults, being dark where they are light grey, and mottled where they are uniform. But if the Koels followed the general rule of the Family, and their young took on the plumage of the female, mark what would be the result—simply disaster to the species. The Koel of Palawan (*Eudynamis orientalis*) is parasitic on a Myna (*Eulabes javanensis*). Now this Myna belongs to a group of eastern Starlings. It is a large and powerful bird, approaching our Jackdaw in size, and, like our own Starling, not a bit of a fool! Thus, let us suppose that the female Koel has successfully planted her egg in the nest-hole of the Myna, and that the latter has not perceived the fraud, and has duly hatched out the young Koel. If the latter, after the manner of some Cuckoos, developed a plumage like its mother's, the Myna would speedily perceive among its own offspring a rufous and barred individual, unlike the beautiful black youngsters which it is the habit of a mother Myna to admire. After a short consultation with her husband, the chances are that the Koel would be hauled out and killed at once. But in this instance, the young Koel does not don the plumage of its mother, when its feathers begin to sprout, but is perfectly black like its father, and thereby the Myna apparently



Young Koel fed by Mynas.

does not perceive the difference between the young Cuckoo and its own nestlings, and brings it up. The illustration, which represents the old Mynas feeding the young Koel, is drawn from specimens in the Natural History Museum, and the Koel is the identical young one which Mr. Whitehead saw the old Mynas feeding, and they are the actual specimens which formed the subject of the story I have told above.

Here perhaps it may be permitted to give a short account of some parasitic birds, or such species as make no nests of their own, but victimize other birds by placing their eggs in the nests of the latter, leaving them the task of bringing up the young one. To write the life history of our own *Cuculus canorus* is a long and by no means easy task, for not a year passes but some new fact in connection with the Common Cuckoo is brought to light. It is indeed a bird whose habits are full of mystery and worthy of a life-time's study. We know that in spring the Cuckoo returns to Europe from its winter home, and is welcomed, like the Swallow, as a sign that winter has departed. Every season letters are written to the newspapers announcing the bird's arrival in March or some other impossible date, when the Cuckoo has scarcely thought of its northward flight, and when the insects, on which it must feed, have not dreamed of putting in an appearance for some weeks yet to come. The northward movement of the Cuckoo is regulated by the season, and the bird very seldom appears till the weather is thoroughly settled and warm, though sometimes even these knowing birds, like the Swift (*Apus apus*), arrive too soon, and a return of the cold winds will keep them in numbers on the southern coasts for days, until absolutely warm spring weather sets in.

Many curious theories have been propounded about the Cuckoo, with a view to explain its remarkable habits. That the males out-number the females seems to be

certain, but whether they are in the proportion of twenty to one, as has been suggested by some field naturalists, seems to me doubtful; but that there may be six or seven males to every female I regard as very probable. The female bird seldom cries 'cuckoo,' and speaks in a different key, with a much higher note than the deep utterance of the male. It is the latter bird that we hear in the spring, for the female is much more silent, and when she does utter her love-cry, it is totally unlike that of the male, and is in fact a rapidly repeated *Kwik-Kwik-Kwik!* which has been likened to water-bubbling. It is sufficient to set every male in the vicinity calling with all his might, and to the tree where the female sits they come one after the other, and often a fierce fight takes place in the upper branches for the favours of the fair one. I have seen two males pursuing a female in broad daylight, but it is in the evening that the courting is chiefly to be observed. I well remember the occasion when, in the twilight, a hen Cuckoo settled in an elm-tree above my head and uttered her peculiar note. At least five males answered from different directions, and that some of them flew at once to the tree where the hen-bird was, appeared certain from the scuffling and fighting which ensued, though the darkness prevented my seeing them.

That the old birds leave before the young ones seems to be also an absolute fact, for the latter are always found travelling alone, or in company with other young birds of their own species, and they complete their moult before they go, if one may judge from a specimen which flew against the windows of the Natural History Museum the other day and killed itself. It was moulting from the mottled stage of the nestling to the first full plumage of the young bird.

Specimens of the old birds are in the National Collection from the following localities, showing clearly where the

Cuckoo spends the winter. From Africa we have examples from the Gold Coast (November); from Damara-land (February to April); from Ovampo-land (December); and from the Transvaal (December and January). An adult male from Bogos-land in N. E. Africa shows that by the 4th of August the old birds are on their return journey to the south. The Cuckoo breeds in the Himalaya Mountains, and winters in the plains of India and China, as far as Australia. Thus it is found in Pegu from September to February, and in many other southern countries during our winter months.

On its return to its breeding quarters, which extend even beyond the limits of the Arctic Circle, the female proceeds to execute her parasitic atrocities. That she is the dominant factor in the propagation of the species may be gathered from the apparent polyandry in which she indulges, and in the fact, which seems almost certain, that each female is parasitic on certain species of birds, and that the instinct is hereditary. Thus a Cuckoo, brought up by Hedge-Sparrows, is probably the offspring of a female which has itself been reared by these birds, which have been the foster-parents for ages, until the hereditary instinct of the female leads it always to select a Hedge-Sparrow as the natural foster-parent of its young. One difficulty arises in this connection, viz. that up to the present I have never heard of a blue Cuckoo's egg being found in the Hedge-Sparrow's nest, as it ought to be if the theory holds good that the Cuckoo always selects the nest of a bird whose eggs resemble the one she has laid. On the other hand, I once asked a lady in whose garden more than one young Cuckoo was reared every year by Hedge-Sparrows, what colour the Cuckoo's egg was, and she unhesitatingly replied that it was blue like the eggs of the foster-parents. All the eggs that we have in the British Museum, taken in Hedge-Sparrows' nests, are mottled

brown; but the subject is worthy of further inquiry, for my informant mentioned above knew nothing of the Cuckoo laying blue eggs. Nor did I at the time—I am speaking of thirty years ago—and Hedge-Sparrows and Pied Wagtails were the most frequent foster-parents in our neighbourhood. It can well be, however, that blue eggs are placed by the Cuckoo in Hedge-Sparrows' nests when the opportunity arises, but are overlooked by those who do not suspect that the bird ever lays a blue egg. The brown eggs one generally finds may be laid by Cuckoos in whom the production of eggs of this colour has become hereditary, but which are at the moment unable to find a suitable nest, with eggs resembling their own in colour and time of laying. The most convincing evidence of the difference in pattern of the egg laid by the female of our common Cuckoo may be studied by any one who examines the series of eggs, with those of the foster-parents, exhibited in the Natural History Museum, and a remarkable confirmation of the similarity of the Cuckoo's egg to that of the species which it victimizes came under my own observation when I was visiting my late friend, Mr. C. Bygrave Wharton, at his house at Totton in the New Forest. He had observed a female Cuckoo for some days frequenting his grounds, and he was not long before he discovered a Sedge-Warbler's nest with a Cuckoo's egg, which, but for its slightly larger size, was an exact counterpart of the eggs of the Warbler, even to the little black line which is seen on the eggs of the latter. A few days later he found another Cuckoo's egg, of the Sedge-Warbler type, laid in the nest of a totally different bird, viz. the Reed-Bunting (*Emberiza schœniclus*), whose boldly-marked eggs are not in the least like those of the Sedge-Warbler. We both drew the conclusion that the Cuckoo which laid these two eggs always produced eggs like those of the Sedge-Warbler, and that on the first occasion she was fortunate enough to find a nest of the

last-named bird with eggs like her own and laid at the same time, but with her second egg she was not so successful, and in despair she placed it in the first nest she could find, which happened to be that of the Reed-Bunting. So struck was I with this singular phenomenon, vouched for by one of the best egg-collectors of the day, that I offered him £10 to allow me to have the two nests for the British Museum. Mr. Wharton, however, rightly considered them to be one of the gems of his collection, and would not part with them—a fact which we both had occasion afterwards to regret, for he subsequently disposed of his entire series of eggs to a gentleman in the South of England, and on the very night of the arrival of the cabinets a fire took place in the building, and the whole of the collection of eggs was burnt to ashes, including, of course, the two clutches with the wonderful Cuckoo's eggs, which had such an interest for me.

I can certainly vouch, from my own experience, that a Cuckoo which places her egg in a Pied Wagtail's nest, deposits therein an egg which can scarcely be distinguished from those laid by the Wagtail. Many times in my young days have I seen the complement of Wagtail's eggs with that of the Cuckoo differing but a trifle in its larger size from those of the foster-parents. And as to blue eggs, which appear to be the rarest of the types which the Cuckoo lays, we have now evidence of their being deposited in the nests of the Pied Flycatcher (*Ficedula atricapilla*), and of the Redstart (*Ruticilla phœnicura*), both of which lay blue eggs. To those who doubt the fact that a Cuckoo ever lays a blue egg, the following proof may be commended, and the actual clutch is in the Seebohm Collection to this day. When Seebohm made an expedition to Valkenswaard in Holland, with Mr. H. J. Elwes, a boy brought in a nest of the Redstart with the usual complement of blue eggs, one being rather larger than the others, and this the lad declared to be a Cuckoo's. Not much notice

was taken of the fact at the time, but when the eggs came to be blown, it was discovered that they were hard-set, and had fully-developed embryos inside. On blowing the large egg, the unmistakable zygodactyle foot of a Cuckoo protruded from the opening, with its toes arranged in pairs, two in front and two behind. No Redstart has such a foot, as it is a Passerine bird, with three toes in front and one behind.

That Cuckoos recognize their foster-parents after a long period seems to be equally certain, for the late Mr. A. D. Bartlett, the Superintendent of the Zoological Gardens, used to tell the story of a young Cuckoo which was brought to the "Zoo" in the autumn, and lived through the winter, which is a very rare occurrence in this country. All those that I have tried to rear have flourished for a short time, but have beaten themselves to death or pined away when the season of their migration came on. The one which survived through the winter in the Gardens was, therefore, looked upon as an exceptional bird, and was prized accordingly. By the following spring it was in fine plumage, and used to call "cuckoo" in the aviary—to all appearance, in fact, it was a thoroughly adult bird. It was determined by the keeper, Travis, whom most of us remember well, to introduce into the Western Aviary several British species, and amongst the latter was a Hedge-Sparrow. No sooner was the latter admitted than the Cuckoo, which had lived for months in the Gardens, and was perfectly able to feed itself, fluttered down to the little Hedge-Sparrow, and began with open mouth to clamour to be fed. Who can doubt that this Cuckoo had originally been brought up by Hedge-Sparrows, and that it recognized at once the species which had been its foster-parent?

Of the date when the old birds begin to leave the country nothing is exactly known, but they undoubtedly

Young Cuckoo ejecting the nestlings of the Meadow-Pipit (after the sketch by Mrs. Hugh Blackburn).

do so before the young ones, for they leave the latter to shift for themselves. Whether they display the same indifference throughout to the fate of their offspring is also not known for certain, but many good ornithologists believe that they do not forget them, and that the female bird watches over the welfare of her young, and may even assist in the ejection of the rightful inhabitants of the nest, or in the destruction of the eggs of the foster-parents. It seems rather extraordinary that the details of a Cuckoo's life should not all have been mastered, considering the number of good field naturalists which abound in Britain, but there is much which is still mysterious in the ways of this species, and many things which require explanation.

One would think, too, that in the case of a bird by no means rare, there would be no possible question as to the method by which the young Cuckoo gets rid of its companions in the nest, and remains supreme in the affection of the foster-parents, who bring it up with unremitting care. The mode in which the little companions of its early days of life are got rid of, has been related many times, and as often discredited. The first account was by Jenner, the celebrated physician, in 1788, but since his time the process of the ejection of the rightful young birds and the usurpation of their nest by the nestling Cuckoo has been witnessed by other independent observers. Gould always had a difficulty in believing it, and thought that the old birds had a hand in removing the eggs and young of the foster-parents, so as to make the way clear for the future bringing up of their own youngster. He could not believe that a nestling of three days' growth had the strength to eject another nestling, and he could not understand how the latter disappeared entirely when the nest was at some distance from the ridge of a bank or a beam, unless either the old Cuckoos or the foster-parents removed the dead nestlings. I remember an instance myself, where a Wagtail had

built its nest in the mould of a large flower-basket, under the shelter of the geraniums, and a Cuckoo had placed her egg in the nest. As the latter was at least two feet from the edge of the woodwork, it appeared as if the old Cuckoos must remove the young Wagtails when they were hatched. Mr. W. Briggs, the well-known Cookham naturalist, who was the head-gardener at Formosa in the days when Mr. Gould and myself used to visit there, kept watch on this particular Wagtail's nest, with a view to see what would happen when the young Cuckoo was hatched, but the nest was deserted, and the observations came to nothing.

The foregoing illustration is adapted from the sketch made by Mrs. Hugh Blackburn of the way in which she witnessed the Cuckoo ejecting the rightful occupants of a Meadow-Pipit's nest. Her account of the proceeding is as follows—

"The nest (which we watched last June after finding the Cuckoo's egg in it) was that of the Common Meadow-Pipit (Titlark, Moss-cheeper), and had two Pipit's eggs besides that of the Cuckoo. It was below a heather bush on the declivity of a low abrupt bank on a highland hill-side in Moidart.

"At one visit the Pipits were found to be hatched, but not the Cuckoo. At the next visit, which was after an interval of forty-eight hours, we found the young Cuckoo alone in the nest, and both the young Pipits lying down the bank, about ten inches from the margin of the nest, but quite lively after being warmed in the hand. They were replaced in the nest beside the Cuckoo, which struggled about until it got its back under one of them, when it climbed backwards directly up the open side of the nest, and hitched the Pipit from its back on the edge. It then stood upright on its legs, which were straddled wide apart, with the claws firmly fixed half-way down the inside of the nest, among the interlacing fibres of which the nest was

woven, and, stretching its wings apart and backwards, it elbowed the Pipit fairly over the margin so far that its struggles took it down the bank instead of back into the nest.

"After this the Cuckoo stood a minute or two, feeling back with its wings, as if to make sure that the Pipit was fairly overboard, and then subsided into the bottom of the nest.

"As it was getting late, and the Cuckoo did not immediately set to work on the other nestling, I replaced the ejected one and went home. On returning next day, both nestlings were found dead and cold, out of the nest. I replaced one of them, but the Cuckoo made no effort to get under and eject it, but settled itself contentedly on the top of it. All this I find accords accurately with Jenner's description of what he saw. But what struck me most was this; the Cuckoo was perfectly naked, without a vestige of a feather, or even a hint of feathers: its eyes were not yet opened, and its neck seemed too weak to support the weight of its head. The Pipits had well-developed quills on the wings and back, and had bright eyes, partially open; yet they seemed quite helpless under the manipulations of the Cuckoo, which looked a much less developed creature. The Cuckoo's legs, however, seemed very muscular, and it appeared to feel about with its wings, which were absolutely featherless, as with hands, the bastard wing (unusually large in proportion) looking like a spread-out thumb. The most singular thing of all was the direct purpose with which the blind little monster made for the open side of the nest, the only part where it could throw its burthen down the bank. I think all the spectators felt the sort of horror and awe at the apparent inadequacy of the creature's intelligence to its acts that one might have felt at seeing a toothless hag raise a ghost by an incantation. It was horribly 'uncanny' and 'grewsome.'"

A further confirmation of the method employed by the young Cuckoo to rid itself of the other occupants of the nest was given by that fine old naturalist, the late John Hancock, in the 'Transactions of the Northumberland and Durham Natural History Society' (vol. viii. p. 213). He made the following notes on the occurrence, as observed by him in the grounds of his house at Oaklands—

"I began in June to search the grounds carefully for as many nests as I could find, that were to have Cuckoos' eggs in them, and was fortunate enough to find one in a spot convenient for making continued observations, on the 17th day of June, 1884. The Cuckoo's egg was in the nest of a Hedge Accentor, containing four eggs of the latter, and built in a bramble-bush, near the bottom of the sloping terrace at Oatlands. I tried the Cuckoo's egg and one of the Hedge Accentor's in water, to ascertain if they were fresh or sitting. The former floated, denoting that it was incubated; the latter, sinking to the bottom, was of course fresh.

"On the 25th of June I examined the nest. No change had taken place. There was still the one Cuckoo's egg in the nest and the four Accentor's.

"On Friday, the 27th June, I looked at the nest at three o'clock in the afternoon, and the Cuckoo's egg was hatched, and one of the Accentor's. At twenty-five minutes to six o'clock I looked at the nest again, and another Accentor's egg was hatched.

"On Saturday morning, 28th June, I rose early, and went to the nest at twenty minutes to four o'clock a.m. All was quiet, and the old bird on the nest. At two minutes past five o'clock I saw into the nest. There were just the young Cuckoo, the two young Accentors, and the two eggs. A few minutes after five o'clock the young Cuckoo attempted to put an egg out of the nest, by getting it on to its back in the most clumsy manner; but it did not succeed in

getting the egg high enough to roll it over the edge of the nest. Immediately after this proceeding the old Hedge Accentor came on to the edge of the nest, and stooped down with its head into the nest, and took some white matter into its mouth (I think excrement from the young birds) and swallowed it.

"The old bird went on to the nest and off again four or five times in about two hours. I left for breakfast at eight o'clock, the old bird sitting on the nest. Returned at half-past eight. The old bird was off the nest, and the young and eggs, as before, were lying quiet at the bottom of the nest. I don't think the young birds have been fed yet. The old bird has returned and is sitting on the nest. I feel sure that the old bird takes the dung from the young bird and eats it. The old bird remained off about ten minutes at a time. She was back and on the nest again this time in a minute or two. She appeared to be very uneasy and uncomfortable, raising her wings and standing on her legs in the nest. In this position she made a kind of shuffle, and in a moment the Cuckoo was on the back of the Hedge Accentor, and in another moment the Accentor was off the nest and the Cuckoo into the nest off her back: what this meant it is impossible to say. The mother was off for about ten minutes, and then on again and off, and when off an Accentor's egg was put on to the edge of the nest by the young Cuckoo in my presence. This was at half-past ten. The egg rested on the edge of the nest for some time, and then it fell down into the bush by the movements of the old bird on the edge of the nest. The Cuckoo then fell into the bottom of the nest, apparently in a very agitated state and overpowered or exhausted by the effort. The mother then returned again to the nest, and proceeded as before in taking off the dung from the young and eating it. She remained a very short time on the nest, but seemed very uneasy, raising herself and standing in the

nest. The Cuckoo seems to be increasing in bulk, and is much agitated, lying at the bottom of the nest. The two young Accentors lay motionless at the bottom of the nest, whilst the Cuckoo kept moving its wings like hands as if to excite or stir its companions into action. In about twenty-five minutes the Cuckoo made two desperate efforts to get one of the young Accentors flung over the edge of the nest, but failed, for when it got the young one to the top it fell back again into the bottom of the nest. Another unsuccessful struggle took place when the mother was on the side of the nest. About eleven o'clock the first young Accentor was put over the edge of the nest, exactly as illustrated by Mrs. Blackburn. The mother was present, but took no notice of the affair going on, but looked on calmly. The second egg was pushed out at one p.m. in the presence of myself, Miss Abbs, and my sister, whom I had specially invited to come and see the proceedings of the young Cuckoo. The last and fourth of the lot we left in the hands of the destroyer. It was sitting almost on the back of the Cuckoo, which had had one try to put it over the edge of the nest, but had failed. At 3.30, when we returned to examine the nest, the young Cuckoo was the sole occupant.

"The first baby Accentor which had been thrown on to the edge of the nest was still alive, so we put it into a Whitethroat's nest, which had four young ones about a day old, and from all appearances it will be properly attended to by its foster-parents.

"The Cuckoo's proceeding, as I saw it, is, in my opinion, the most wonderful and unaccountable piece of business that I ever witnessed in bird life.

"On Saturday, July 5th, I looked into the nest, and to my astonishment the young Cuckoo lay motionless at the bottom of the nest, and I found that it was dead. In all probability it had died from the heat of the sun, for a day

or two before, when I had looked at it, the Cuckoo was panting, evidently affected by the heat; in fact we had shaded it, by placing some bracken leaves to screen it from the sun, but by some means the leaves had been removed, and the sun's rays fell direct on the young Cuckoo.

"To summarize this account, I may state that the eggs of the Cuckoo and four eggs of the Accentor were found in the nest of the Accentor on the 17th June. On Friday, June 27th, the Cuckoo's egg and two eggs of the Accentor were hatched. On Saturday, June 28th, one attempt to put out Accentor's egg did not succeed. At 10.30 a.m. the first egg was put out of the nest. About 11 a.m. the first young Accentor was pushed out. At 1 p.m. the second egg was pushed out in the presence of three witnesses. The last of the lot, the second young Accentor, was removed between 1 and 3 p.m. during the time I was absent."

It may interest my readers to know that a recent computation of the number of species in which the Cuckoo is known to deposit its egg is 119. In some instances a mistake has probably been made as to the Cuckoo's egg, as for instance in the case of the Little Grebe, where an abnormally small egg of the actual species may have been mistaken for that of the Cuckoo. This summer (1898) a remarkable egg, no bigger than that of a Cuckoo, was found in the nest of a Moorhen (*Gallinula chloropus*) by Mr. Philip Dalby, of Castle Donington, and by him presented to the Natural History Museum, along with two normal eggs of the Moorhen. It was coloured exactly like the usual eggs of the latter species, but was of tiny dimensions; but in Mr. Dalby's opinion and my own, it was nothing but an abnormally small egg of the *Gallinula*. Similar instances may have occurred with other species of birds.

One curious fact about the egg of *Cuculus canorus* is its

small size, extreme variability of colour, as well as the thickness and weight of the shell, by which it can always be told with certainty from the eggs of the other birds with which it is placed. Dr. Rey, who has for years made a special study of the Cuckoo and its nesting-habits, has come to the conclusion that the birds inhabit a very limited area, to which they return year after year. Each female lays about twenty eggs in the course of the season, and these are laid on alternate days, and each female Cuckoo lays similar eggs throughout its life, Only one egg is deposited in a nest, and when a second egg is found, it must be the work of another female. Dr. Rey confirms my idea that each Cuckoo is parasitic on a particular species of bird, and only puts its eggs in another bird's nest when that of its chosen foster-parent is not to be found, or it is not ready to receive it. Although the number of Cuckoos' eggs which do not agree with those of the foster-parents is very large, yet the resemblance of the parasitic egg to that of the birds in whose nest it is placed, is remarkable, and in some cases the likeness is absolute, though as yet there has been no approach in the colour of the Cuckoo's egg to those of such birds as the Wrens, Hedge-Sparrows, or Willow Warblers. In nearly every case the egg deposited in the nest of the Redstart is found to be blue like that of the latter bird.

Cuckoos, however, are by no means the only species which are parasitic on other birds, and the Cow-birds (*Molothrus*) present us with still more curious phenomena in the way of nesting, especially as some of their ways would appear, at first sight, to be highly detrimental to the interests of the birds themselves. As regards the common North American Cow-bird (*Molothrus pecoris*) the late Captain Bendire has published full details in his 'Life Histories of North American Birds,' and some of his facts are very interesting when compared with those recorded of

our European Cuckoo. The males exceed the females in number, and the latter are polyandrous. Each female is said to lay from eight to ten eggs, and Captain Bendire believed that several days elapsed between the laying of the eggs. "It is not likely," he says, "and this is very fortunate indeed, that more than half of the eggs are hatched, as some are dropped in old and abandoned nests, or, when the female is hard pressed, even on the ground, others in just completed nests in which the rightful owner has not yet laid, who, seeing the parasitic egg in its nest, either abandons it entirely, or constructs another over the first, burying the strange egg among the building materials. The same habit has been observed by Mr. W. H. Hudson in some of the South American Cow-birds, and he mentions an instance in which he examined a bulky nest of the Yellow-browed Tyrant-bird (*Sisopygis icterophrys*), and found, as he expected, some buried eggs of the parasitic *Molothrus* underneath the superimposed nest, but on breaking the three eggs, he found that two were addled, but the third contained a perfectly developed and hungry embryo of the parasitic bird, and it was evident that the warmth engendered by the nest above it, and doubtless also the heat of the sitting bird, had aided its own vigorous constitution in keeping it alive.

Whenever the Cow-bird victimizes a foster-parent, it seems to be its regular custom to peck holes in some of the eggs of the latter, so that their undivided attention may be bestowed upon the foundling which is in their midst. The period of incubation seems also to be less in the case of the Cow-bird's egg than in that of most Passerine birds, as it only takes ten or eleven days to hatch out, so that when it is placed among eggs of other birds already sat on, it comes out of its shell about the same time, and eventually becomes the sole occupant of the nest, not, as far as is known, by ejecting the other nestlings as the young Cuckoo does, but

simply by smothering the other young birds with its clumsy weight, and by monopolizing all the food which the old birds bring, so that the other young ones in the nest are gradually starved.

In South America the habits of the Cow-birds are certainly very curious, and Mr. Hudson gives some remarkable experiences of the nesting of the three species of *Molothrus* in Argentina, *M. bonariensis*, *M. rufoaxillaris*, and *M. badius*. Though the original account, instructive and wonderful as it is, is too long to be produced in full, a few notes may be given. The Argentine Cow-bird (*M. bonariensis*) has a dull-coloured hen, and, as in the case of our Cuckoo, the males predominate in number over the females, and the proportion is said by Azara to be that of ten males to every one female. For four months the latter goes on laying eggs, and besides putting several into the nests of other birds, numbers are dropped by her in every direction, and are of course lost for any good that they are. Not only the female herself, but the male also, pecks holes in the eggs of the foster-parents in order to destroy them, but they will also destroy their own eggs in the same manner along with the others, a proceeding which so savours of madness that it is impossible to explain it; and still more extraordinary, one species of Cow-bird (*M. rufoaxillaris*) is parasitic on another (*M. badius*). Whether the Argentine *Molothrus bonariensis* once made a nest and has gradually abandoned the practice, one cannot say, but Mr. Hudson states that he has twice known the species to make an attempt to do so, but the result was failure in both cases. He thinks it probable that *M. bonariensis* was once accustomed to build in holes or in covered nests, as both male and female birds take the greatest interest in domed nests, such as those of the Wood-Hewers (*Dendrocolaptidæ*), and persistently haunt them and examine them, but never place their eggs there. Mr.

Hudson says that the same curiosity was exercised by the Cow-birds towards any nesting boxes he put up for the accommodation of birds in his homestead, and although they exhibited the liveliest curiosity, they never seemed to be able to face the darkness of the interior, and never deposited any eggs.

Mr. Hudson says that he believes that every female of the above-mentioned species lays from sixty to a hundred eggs every season, though he admits that he has no actual proof of this, beyond the evidence of the extraordinary number of wasted eggs which are found. He also calls attention to the mistakes and apparent imperfections in the bird's economy, as follows—(1) The Cow-birds frequently waste their eggs by dropping them on the ground. (2) They also frequently lay in old forsaken nests. To make sure of this fact, he has placed several old nests in trees and bushes and found that eggs were laid in them. (3) They also frequently lay in nests where incubation has actually begun. When this happens, the Cow-bird's egg is lost if incubation is far advanced. (4) The female often lays several eggs in the same nest, instead of laying only one, as the North American species of Cow-bird do. (5) Several females lay in one nest, so that the number of eggs in it makes incubation impossible. One December, Mr. Hudson collected ten nests of the Scissor-tailed Tyrant-bird (*Milvulus tyrannus*). They contained a total of forty-seven eggs, twelve of the Scissor-tails and thirty-five of the Cow-birds. Probably three-fourths of the nests of the Scissor-tails are abandoned in consequence of the confusion caused in them by the Cow-birds. (6) Both male and female Cow-birds destroy many of the eggs in the nests they visit, by pecking holes in the shell, breaking, devouring, and stealing them. To such an extent do the birds carry this destructive habit, that Mr. Hudson has often carefully examined all the parasitical eggs in a nest, and after three

or four days he has found that all these eggs have disappeared, others, newly-laid, being in their places.

The Screaming Cow-bird (*Molothrus rufoaxillaris*) is a resident species in the neighbourhood of Buenos Ayres, along with the Bay-winged Cow-bird (*M. badius*), and the latter is victimized by the former species, while, as Mr. Hudson remarks, it will never allow the other Cow-bird (*M. bonariensis*) to approach its breeding-place. The nest of the Leñatero or Firewood-gatherer (*see* p. 211) is often seized upon by the Bay-winged Cow-birds, and the above-named naturalist relates the story of one of these nests upon which the Gatherers had been employed all the winter, till it had become a bulky structure about twenty-seven inches deep, and from sixteen to eighteen inches in circumference. When thus nearly finished it was visited by a couple of Cow-birds, and the female critically examined the nest, as if she was the one who had given orders for its erection. A few sticks were re-arranged by her, others thrown out, and a general air of proprietorship maintained, which culminated in an attack on the rightful owners and the narrow escape of the female bird from death. Later on the Leñateros re-occupied their nest, but the Cow-birds proved too strong for them, and ultimately it passed into the possession of the latter, who threw out all the young ones and opened a new road into the interior of the nest. Then two Screaming Cow-birds (*M. rufoaxillaris*) appeared on the scene, and were apparently much interested in the nest. On climbing up to the latter Mr. Hudson found, to his surprise, that it contained *ten* eggs, instead of *five*, as he had expected. These could not have been the eggs of the Argentine Cow-bird, the third species of the district, as the Bay-wings would never allow them to lay in it. Three times Mr. Hudson took away the eggs, and on the fourth occasion seven eggs were once more found, instead of the normal five which a Cow-bird lays, and hence it was evident that

two female birds were using the nest. Subsequently he found that this was the case, but it turned out that they were of different species, and that the Bay-winged Cowbird (*M. badius*) was actually parasitic on one of its own relations, leaving the task of bringing up its family to *M. rufoaxillaris*.

Nor is the above the only instance in which birds of the same genus are parasitic on one another, for Dr. E. A. Goeldi, the Director of the Museum at Parà, states that one of the Hang-nests (*Cassidix oryzivorus*) places its egg in the nest of another Hang-nest (*Cassidix persicus*). Further south, in the neighbourhood of Rio de Janeiro, it victimizes other Hang-nests of about its own size, such as *Ostinops decumanus*, and probably *Cassicus hæmorrhous*.

A very curious nesting habit has been developed in the Black Cuckoo of Central and South America, called "Ani," in some places known as the "Savana Blackbird" (p. 295). Of *Crotophaga ani* in Jamaica, Mr. W. E. D. Scott writes as follows—

"Their nesting habits are exceedingly curious and interesting. Many individuals (possibly members of one flock) work together in the construction of a large nest, in which all the females of the company lay their eggs. The number of eggs deposited in different nests varies greatly, but it is of course dependent on the number of birds in a company. Six and eight eggs are commonly found. I once took eleven, and in August last year I saw a clutch of twenty-one that had been taken from a single nest! It is probable that normally not more than two eggs are deposited by each bird, but nothing definite can be said on this point. The nest, which is usually placed high up in a tall tree, very frequently in a clump of mistletoe on a bastard cedar, is a large loosely-constructed mass of twigs, entirely lined with dry leaves. But the most remarkable circumstance in connection with the nesting of

these birds is the deposition of the eggs in regular layers with leaves between. This custom I had long heard of before an opportunity offered for personal observation. In the first nest I examined, the eggs were in two distinct layers, separated by a deep bed of dry leaves; the bottom layer consisted of four eggs, and these, strange to say, were all infertile. I believe this singular habit is practised in all cases where a large number of birds resort to the same nest. The eggs are of a deep bluish-green, but when freshly laid are covered with a white chalky coat, which soon becomes much scratched and erased on all. Now what seems very singular is, that comparatively little of this chalky covering gets rubbed off the sides, where from the turning over of the eggs in the nest we should expect to see the greatest extent of denudation, whereas *one or both ends* are nearly *wholly* denuded. That this circumstance is not merely accidental, I feel sure, as in a large series of clutches that I have examined more than two-thirds of the number of eggs show this peculiarity. So cleanly and evenly is it done, and to such an extent, that I feel confident it is the work of the birds themselves, their beaks alone being able to accomplish it. At the same time it is easy to see that the marks and scratches at the sides are the work of friction with the twigs and leaves of the nest. I have found eggs and young in February, and throughout the succeeding months to August, two or three broods probably being reared. I have also seen young, fully fledged, but unable to fly, hopping about the branches of the nesting tree, and on another occasion, some, more advanced, searching for insects in the grass at the roots of a large guango tree in company with many old birds."

CHAPTER XII

THE MIGRATION OF BIRDS

The Lighthouse on Heligoland (after Seebohm).

Scanty knowledge of the subject — Summary of observations by Mr. W. Eagle Clarke—Gätke's observations in Heligoland—Migration in the Mississippi Valley—Migration in the North Sea —Mr. Abel Chapman's remarks on the flight of birds.

THERE is no subject in the ornithological world about which people speak and write so glibly as on the "Migration of Birds," and yet there is no branch of Natural History of which less is really understood. Those who have laboured

longest at the study of ornithology are the men who know what an immense amount of work there is still to be done, and how little is really known; for our acquaintance with the phenomenon of migration is as yet of the slightest, and we are at present but on the threshold of its investigation. Much that has been written is mere guess-work, and it is only where carefully-prepared statistics have been obtained by the committees of experts appointed to examine into the records of capture and observation, that we have any real grounds upon which to form conclusions.

The fact of migration is one with which every one of us is familiar from our childhood upwards. In spring the Swallows return to their northern homes, and Cuckoos and other birds well-known to us, make their re-appearance in England, as spring returns. In the autumn they depart and are not seen again till the following spring. In the winter Fieldfares and Redwings visit us from the north, and they return to Scandinavia when spring comes round again. All these facts are undoubted, but the exact method of the migration of birds and the causes of it, still remain a very interesting problem, and one which will repay the investigation of a lifetime.

Of one branch of the subject we now know much more than our forefathers did, viz. as to the winter homes of most of our British species. The enormous collection of birds in our National Museum has been formed by ornithologists for whom the geographical distribution of animals has possessed a life-long interest, and the list of specimens in the 'Catalogue of Birds' can be read like a book by those who understand the subject, for here is set forth in line the material from which is derived the series of facts which prove the geographical range of the species of birds over the surface of the globe. The British Museum now possesses a collection of 400,000 specimens of birds and eggs, and this series is none too large for a complete study

of the life-history of the 13,000 known species of birds, while scarcely a day passes without the addition of specimens which emphasize some new fact in ornithology. It was not always thus with our National Collection, and the very fact that, until recently, the most valuable and reliable collections of birds in this country belonged to private individuals, proves that, at one time, the British Museum did not possess anything like an adequate series of specimens for the study of ornithology. A glance at the examples of bird-skins which belonged to the old collection in the Museum is sufficient to prove this fact, for we find that "North America," "Brazil," "Indian Archipelago," "Africa," etc., were considered to be quite sufficient for the localities of the specimens: and so little heed was given to exact details in olden days that when collections, with full particulars of sex, locality, and date of capture were received, the original labels were destroyed, and another label substituted, on which these particulars were not recorded. Thus much valuable evidence was lost, and the series in the British Museum could not compare with the collections which were being formed by private workers in this country.

The great German Ornithologist, Pastor C. L. Brehm, has often been held up to ridicule for the number of species into which he sub-divided the birds of Europe, and it is certainly true that many of them had no real basis; but the minute study which he gave to the variations in European birds cannot have been without its weight with the ornithologists who succeeded him. No influence for good, however, has ever equalled that of the small band of Ornithologists who founded the "British Ornithologists' Union" at Cambridge in 1858, and by whom the publication of the 'Ibis' was initiated. The names of P. L. Sclater, Alfred Newton, F. D. Godman, Lord Lilford, Osbert Salvin, E. Cavendish Taylor, Canon Tristram, and John Wolley, can never be forgotten as the leaders of Ornithology in this country;

while at the same time the influence of Professor S. F. Baird in America, was beginning to make itself felt in the interest of more exact and careful study. The result has been that both in Great Britain and in America the school of younger ornithologists has been educated in the method of exact work instilled into them by those "Grand Old Men," the masters of Ornithology in the nineteenth century.

In the British Museum to-day reposes most of the material which was gathered together by the ornithologists above-mentioned and their pupils, and it has been a great pleasure to me to witness the gradual incorporation of the collections made by British naturalists and travellers in all quarters of the globe; for now we have material, collected with the greatest care and exactness, which illustrates not only the differences of plumage in old birds and their young, but traces out their geographical distribution with such nicety that even the migrations of the species can often be followed from a study of the specimens alone.

Nevertheless there is still an enormous amount of work to be done, if only in the way of summarizing the many reports on migration which are published every year in the different countries of Europe, and I am glad to know that Mr. Eagle Clarke is likely to publish a book on the subject. He is the greatest living authority on the subject, and if any one wants to know what such a work means, let him study his 'Digest of Observations on Migration of Birds at Lighthouse and Light-vessels, 1886—1897.' This report of twenty-seven pages represents *eight* years of close application to the task.

One of the most interesting of Mr. Eagle Clarke's conclusions is that the migration of birds, from east and west, across Heligoland, has apparently nothing to do with the migration which touches the east coast of England from the

same direction. This is a very interesting fact, apparently borne out by the observations of the chroniclers on the various light-ships, but it has surprised me not a little, for it is astonishing to find that of all the flood of migrants which I saw in Heligoland in September and October 1876, few, if any, were likely to reach England, to which country many of them seemed to be bound in a direct course. The story of the visit which I made in company with the late Henry Seebohm, has been narrated by the latter and repeated in many books, but it was certainly one of those experiences, the memory of which never dies. The never-ending variety of incident was one of the chief features of the visit, for one never knew what would happen next as regards the species of bird to be encountered. Rising in the morning at daybreak we used to take a long walk along the top of the island among the potato-fields which covered its summit, and none of us knew what bird would rise from the ground. Our first shot might be at a Wood-Lark, or a Brambling, while from our feet would suddenly start a Jack-Snipe or an Aquatic Warbler, or a Snow Bunting. I have shot all these birds on Heligoland before breakfast, and when seated at our morning meal, we always had the window open, and our walking-stick guns in readiness for any bird which might land in the bushes in front of the house, one of the advertised advantages of which was supposed to be its "garden." On to these bushes would drop the little waifs from their journey across the sea. Sometimes we could see them making for the island, and could distinguish the species before they settled, and many interesting additions to our collection were made from that sitting-room window. After breakfast, we would pay a visit to Aueckens, the bird-stuffer, to see what birds had been brought in by the natives, or we would spend the rest of the morning in visiting Gätke's Museum and talking over the wonders which it contained, or perhaps we might take another turn

with our guns over the potato-grounds. After lunch-time shooting was permitted on Sandy Island, which lies about a mile and a half from the main rock, and is one of the best bathing-places in Europe; for if the weather be rough on one side, it is easy to haul the machines over to the calm water on the other side. During the morning the bathing-guests had the island to themselves, and shooting was not permitted till 2 p.m. Sandy Island was always an interesting place to visit, for there were sure to be Plovers and Sandpipers, while quite a number of interesting Passerine birds were also procured there, such as Rock-Pipits, Ring-Ouzels, Buntings and Willow Warblers, which frequented the few bushes in the centre of the island.

If a sea-fog came on it was not so pleasant, and on one occasion we imagined that we should have to spend the night on the island, if the boatmen did not manage to reach us from the rock. This, however, they managed to do, steering by compass, but a white fog in the North Sea is an experience to be remembered, especially if it lasts for four or five days, as it did while we were in Heligoland. Then the time hangs somewhat heavy on one's hands, as not a single bird arrives, and there is nothing to shoot, and not a specimen to prepare.

One of our most curious experiences was the Woodcock shooting in the early morning. When the tide was low it was possible to walk round the island, though it was by no means the pleasantest promenade in the world, for the path lay over the *débris* of rocks which had fallen from the main mass, and as these rocks were wet and covered with sea-weed, the mode of progression was slow, and occasional awkward falls resulted. Each one of the party carried his gun in one hand and a piece of stone in the other, for the Woodcock take refuge in the holes on the side of the rock, and the stones had to be thrown up into the caves to startle the birds. When they came out they proved an

easy shot, for there was none of the doubling which one sees in the English woods in autumn, but the birds flew straight away, with a flight like that of an Owl. More than once, too, when in Heligoland, I shot a Jack-Snipe in the day-time on Sandy Island, for when flushed, the birds often perched on the top of the seaweed and allowed themselves to be approached within gun-shot.

Seebohm was extremely keen on getting Willow Warblers (*Phylloscopus*), a genus about which he was writing at the time of our visit, while I was equally anxious to get Crows for description in the third volume of my 'Catalogue of Birds.' I was glad to hear from Gätke that I could have a cart-load of Hooded Crows if I wished, and I understood afterwards what he meant. For many days after our arrival not a "Hoody" put in an appearance, and I was greatly pleased when at last a small flock settled on the island, out of which I managed to secure two specimens under rather amusing circumstances. The Crows had settled on the edge of the cliff, and were about a dozen in number; two of them I managed to stalk, but, to my disappointment, they rolled over the side of the cliff. As I was suffering from vertigo at the time and could not look down any great height, I did not like to approach the edge, but at last, wishing to see what had become of the birds, I crawled through the mud to the side of the rock, and looked over. The tide was out, and, two hundred feet below me, I saw a man walking with a gun under his arm, so I shouted to him in the best German I could muster, that I had shot two "Nebel-Krähe," and that if he would find them and take them to Aueckens to be skinned, I would give him sixpence! He held up his hand in token of assent, and the next morning I found that the Crows had been delivered and were already skinned when I reached the bird-stuffer's shop. That same evening, after dinner, I was walking on the few planks which at that time

formed the esplanade in Heligoland, when a gentleman accosted me and hoped that I had got the Crows quite safely. "I sent them up by one of my servants," he explained, and I afterwards found out that he was one of the Chief Government Officials of the island. Well! it is not given to everybody to offer a Colonial Secretary sixpence in bad German from the top of a cliff!

The Hooded Crows afterwards appeared in small parties of from six to twenty, all migrating from east to west. They were never out of sight during the day-time, for as fast as one party disappeared, another was seen approaching over the sea. Even during the night this stream of migration went on.

Heligoland, certainly, is the place on which to study migration, and Gätke is its prophet. Any one who wishes to take up the subject must read this author's work on 'Heligoland as an Ornithological Observatory.' It is the one book in which the observations of fifty years have been steadily summarized, and it will ever remain a classic. Other popular books have been written on the subject of migration, but they present only the general ideas which occur to the mind of every ornithologist, and the conclusion must be that we know at present very little about the phenomena of migration, and furthermore, that we shall not be able to generalize until we have more reliable statistics to work upon. Mere theory and guess-work will not help us.

There are, however, certain facts on which we may ground an opinion, but they are very few. The specimens of our British migrants which have been shot and preserved in their winter homes, enable us to judge of some of the routes by which the birds travel, but even here some difficulty intervenes. Africa is evidently the continent which receives most of our migratory species, and the specimens in the British Museum prove their occurrence in Africa

during our cold season, but a vast portion of the last-named continent remains still a *terra incognita* to the naturalist, and though we have specimens of our Nightingale, Willow Warbler, and Cuckoo from the Gold Coast, no one is able to say that the birds have gone in a direct line from England or France to the coast of West Africa. To prove this we shall require an ornithological station at Timbuctoo, which must tell whether, or not, our migrants cross the Sahara.

That the Nile Valley receives a vast stream of migrants is certain, and that there is a convergence towards this migration-centre seems to be a determined fact, but there are other lines by which the streams of migration trend towards the African continent, by way of Gibraltar, by Genoa, Corsica, Sardinia, Italy, Malta, Greece and the coast of Asia Minor. Too much stress, however, has, as it seems to me, been laid on the certainty of these routes of migration, and the truth will be reached, not by drawing lines like telegraph-wires across the world's surface, as if every one of the routes indicated was known and proved by statistics, but rather by the patient accumulation of the latter. Further, it would seem to be the case that birds impelled by the instinct of migration, which is undoubtedly an hereditary faculty, wing their way to their southern homes according to the circumstances which impel them, some travelling by day and some by night, as the conditions of the weather are favourable for their journey, or the reverse. It is possible for a Londoner to stand on Primrose Hill on an autumn night and hear the small Plovers and other Wading-birds calling as they pass overhead in the darkness, and I have also heard Godwits pass low over Bournemouth in pitch-darkness. I have, however, also listened to a flock of Knots, in the early days of August, flying over Chiswick in full sunlight in the middle of the day, though they were at such a height as to be quite invisible, and were only detected by their notes, as they called to one another.

Yet these same species also migrate along the sea-coasts, and their lines of migration have been assigned to them by some writers, as if there were an irrevocable law which guided their movements. I remember also that for three days in succession in the spring of 1881, Turtle-Doves lighted on the s.s. *Ancona* as we went down the Mediterranean. They were following no direct line of migration, but were simply bent on going northwards as fast as their wings could carry them across the sea.

To gain an idea of what migration means, let us take the case of the Swallow, about which a good deal is known. Our English Swallow finds its winter home in Africa, and I have already alluded (p. 83) to the draggled state in which it finally arrives in its winter quarters. On the route there is no great barrier of water likely to arrest the powerful flight of a bird like our common Swallow, so that it meets with no serious obstacle in its progress southward. We know that it arrives on the coast of West Africa, and spends the winter there, as we have specimens in the British Museum to prove the fact, but by what route does it go? Across the Mediterranean direct, or by the short cut by Gibraltar, or from Italy to Malta, and so to Algeria, and across the Sahara? Or does it follow the coast-line and so come to Liberia and the Gold Coast?

A Swallow may even arrive in its West African home by the other great migration route, viz. by the Nile Valley, the course followed by so many European birds. We know that vast numbers of our common Swallow visit the Cape Colony, and Mrs. Monteiro tells us how a swarm of these little birds took refuge in her house at Delagoa Bay after a storm, and sat in rows on the cornice and the bedstead till the morning sun beckoned them out again, *minus* three of their number who perished from the cold. This direct Nile route is taken by many species, and among those which reach the Cape Colony and the Transvaal are

The Common Nightjar (*Caprimulgus europæus*).

our Swallow, Cuckoo, Sedge-Warbler, Garden-Warbler, Willow-Warbler, Bee-eater, Kestrel, and many others; many of them being birds of weak flight, which one would not have believed capable of performing such a long journey. An excellent example of direct migration to South Africa is that of our Common Nightjar (*Caprimulgus europæus*). The route of the British species is marked in East Africa and the region of the Great Lakes by the specimens procured by British and German explorers during recent years, and we find that although many species, like those above-mentioned, go straight away to the Cape Colony, there are many which do not do so; and this without any apparent reason, as they are migrants of the same type as those which reach South Africa.

Take, for instance, the case of our two European Shrikes, the Red-backed Shrike (*Enneoctonus collurio*) and the Wood-chat Shrike (*E. pomeranus*). Both species are found in summer in Europe, and the former is not a rare bird in England. Their habits are identical, and they are both migratory, but the Red-backed Shrike extends its winter range to the Cape Colony. Not so the Wood-chat, which goes to North-eastern Africa, and to Somali-land, but then re-appears in West Africa. Failing information that it crosses the Sahara direct, we can only imagine that it turns westward from the Nile Valley, skirts the Sahara as if it were still a sea, and re-appears in West Africa. The Whinchat (*Pratincola rubetra*) apparently follows the same course of winter migration, and appears in Senegambia and the Gold Coast. The Willow-Warbler is found not only in West Africa, but also in South Africa, and it likewise winters in the oases of the Northern Sahara, so that it is probably from this base of migration that the species reaches Senegambia, but nothing is really known. All must be conjecture until stations of observation have been established.

To return to our Common Swallow, we find that its winter range extends to the Indian Peninsula, but the birds which migrate thither during the cold season are probably those which breed in Central Asia and go due south on migration, for there is no east and west migration in the species, and the birds which nest in Europe would not turn eastwards for their winter home. Further east there is a close ally of our Common Swallow, known as *Hirundo gutturalis*, which differs in having the black band on the fore-neck incomplete. In every other respect it resembles *H. rustica*, and like the latter species, it migrates south in winter from its breeding-places in Siberia, Northern China, and Japan. Proceeding directly southwards, it has been found in winter in the eastern portion of the India Peninsula, the Burmese provinces, and thence south through the Malayan Archipelago to Northern Australia. Thus this Eastern representative of our Common Swallow teaches us that in the far East there is going on the same migration as in the West, and there we can perceive three main routes. One extends along the coast of China directly south to the Malayan Archipelago, especially to Borneo and Celebes. By this route journey many Warblers, such as the Eastern Reed Warbler (*Acrocephalus orientalis*) and Pallas' Grasshopper Warbler (*Locustella certhiola*), besides tropical forms like Swinhoe's Ant-thrush (*Pitta oreas*). On the other hand, a stream of migration seems to extend to Formosa and the Philippines, of which such species as White's Thrush (*Oreocichla varia*) and the Ruby-throated Robin (*Calliope camchatkensis*) are examples; while a third migration-route apparently trends towards the Burmese countries. This may probably prove to be an overland one, judging from Tytler's Swallow, which nests in Kamtchatka, and winters in Burma, while Haughton's Tattler (*Pseudototanus guttifer*) and the Spoon-billed Sandpiper (*Eurhynorhynchus pygmæus*) also visit the

coasts of Burma and the Bay of Bengal in winter, but are neither of them found to the southward along the shores of the Malayan Peninsula. As for other suggested migration-routes, the evidence is at present purely conjectural, and no statistics are yet possible.

In North America there are also lines of migration-flight, which are apparently well defined, one on the Atlantic side, another along the Pacific coast, and a third route along the Great Mississippi Valley. We find certain species, especially Wading-birds, which frequent the western coast of North America and migrate southwards to the South American continent, always following the western coast-line. Similarly certain species follow the eastern coast route, but while some Passerine birds winter in Central America, others do not follow the continental line, but pass by the West Indian Islands and those of the Bay of Honduras to the Northern coast of South America and Brazil.

The waves of migration which pass up the Mississippi Valley have been checked by Dr. W. W. Cooke and a number of observers, and the facts elicited are of the highest importance, though they seem to have been overlooked by recent writers on migration in this country. In the years 1885 and 1886 Dr. Cooke, with the aid of a number of other skilled observers, traced the migration wave in the Mississippi Valley, and among the facts which they observed was the particularly interesting one that sudden cold not only checked the birds on their northern flight, but that several species not only arrested their progress, but even went back for the time. I give a short quotation from Dr. Cooke's work to show the careful way in which the records were kept and the conclusions tabulated. This is the method which will have to be everywhere followed if we are to understand what migration really means, and the only manner in which we can

hope to find out the real lines of flight pursued by the birds during their journeys to and from their breeding-grounds.

Writing of our Wild Duck or Mallard (*Anas boscas*), which also inhabits North America, Dr. Cooke says—"At Moss Point, Missouri, only a few miles from the Gulf, the first Mallards arrived on November 15, 1883, and the bulk from December 1 to December 13. They were present by thousands during their short 'winter,' and the bulk left the coast about the middle of January. All were gone by February 1, at which date the bulk had hardly passed north of the Gulf States, so that during the latter part of January and the first half of February the great mass of the Mallards was gathered between parallels 33° and 37°. In Southern Louisiana the movements of Ducks in general began somewhat later, but they were fairly under way by February. Probably few Mallards were included in this flight, which was principally composed of the coast Ducks rather than river Ducks. Before this, in the latter part of January, and the first few days in February, the warm wave had caused great movements among the river Ducks. They returned to Southern Illinois, and to those parts of Southern Missouri up to Saint Louis, from which they had been driven early in January. The limit of this movement was at Odin, Illinois (Lat. 38° 39′), and on the Mississippi river, at Alton, Illinois (Lat. 38° 55′). In the west the wave was scarcely felt north of Caddo, in Indian Territory, and not at all in the northern part of the Territory, where the moisture, which fell in copious rains in the southern portion, was precipitated in snow and sleet. Then followed a month of constant swaying to and fro, the flight advancing one day, to be driven back the next one by fierce north blasts. During the entire month practically no headway was made. A few stragglers managed to force their way northwards for a short distance, but the bulk made little movement,

scarcely passing beyond the Gulf States, and the struggle was temporarily terminated about March 1, by a 'second winter,' which recongealed the open water and sent the Ducks back to winter quarters. . . . . At Saint Louis the thaw began on March 9, and was fairly under way on the 10th. Ducks began to return, and the first real advance since February 1 was made on March 10. By the 12th and 13th they had moved to Lat. 41° 10′ in Illinois, and 41° 42′ in Iowa. The movement rapidly gained headway. The Ducks had been held back so much later than usual, that as soon as a movement was possible, it was participated in by the whole family. March 15 and 16 were great days for migration, aided by a warm south wind. The movement was peculiar in that the bulk was almost abreast of the van. . . . . From this time, each day was marked by a record of advance. . . . ."

In the same careful manner is recorded the migration of many other birds, and that of the Thrushes, Warblers, and Swallows is very interesting. With regard to the speed at which birds travel, Dr. Cooke credits the Purple Martin (*Progne purpurea*) with a rate of 120 miles for every night of movement. On this rate of speed much speculation has existed, but most of it is guess-work, and it is a fact almost incapable of proof. From the statistics compiled for his Report, the above-named observer came to the conclusion that the speed of migration is different in some species to others, and while he credits some with a journey of only twelve miles a day, others attain a distance of from twenty-three to twenty-eight miles. These are of course Land-birds. Geese, he thinks, may travel from 300 to 600 miles at a single flight. These figures are moderate enough, and if we consider that Thrushes and Warblers are likely to feed as they go, a distance of a dozen or twenty miles a day is ample progress, and it is scarcely possible that the Arctic Blue-throat (*Cyanecula suecica*) can leave Africa at dusk

one evening and arrive in Heligoland nine hours later, as Gätke believed, having travelled 1600 geographical miles during the night, at the almost miraculous velocity of one hundred and eighty miles per hour. This is a prodigious performance to assign to little birds of the size of our Robin.

A great deal has been written about the distress which a bird experiences in going through its moult and passing through its migrations. Doubtless many small birds do perish in the sea, especially if they get blown out of their course by high winds, but my own belief is that migration is only part of their ordinary life, and is taken as such. The migration of the little Gold-crest has been known to continue for eighty days to our eastern coasts, and many of my readers must have noticed the way in which Larks and Meadow-Pipits land on the coasts of Norfolk in the early morning, if one has been up in good time in the month of September. A Pipit comes tripping in from the sea and drops into the first field he comes to. Larks fly low and come in little parties, uttering their call-notes, as if they had only been indulging in a morning flight, and none of them seem at all distressed. On the other hand, Starlings appear to have a set purpose in their flight, and come in little packs, flying low, and not uttering a note, nor taking any notice of other flocks of Starlings which may be feeding on the saltings. These migrants usually pass straight on into the interior without stopping, and their flight is of quite a different nature to that of the Rooks, who come wheeling into land, as if the crossing of the North Sea were the simplest matter in the world. Some Wading-birds, too, take matters easily, and certainly rest by the way to feed, proceeding by easy stages. Others, on the other hand, pass high over head, and may occasionally be decoyed by whistling their call-notes to descend to the mud-flats to feed, which they do most voraciously, keeping close together and probing the mud vigorously with their bills. At other

times no amount of whistling will induce them to come down, and they pass on high in the air. Species like the Curlew Sandpiper (*Ancylochilus subarquatus*), which go a long distance to their winter home in Africa, when once on the move, proceed at a great pace, in perfect silence; even if fired at, they close their ranks immediately, and hurry on till they get to the end of a spit of land, and then go steadily out to sea. It is equally certain that the birds which occur on the Bermudas must have come a long way across the sea to reach them.

It is said that many small birds take advantage of the larger species, such as Geese and Cranes, and travel on the backs of the latter, and are thus assisted on their way, but it is also possible that birds may ascend to higher atmospheres where flight is easier, and thus the migratory effort is considerably aided. On this question some very interesting remarks have been made by Mr. Abel Chapman, one of our best field naturalists, and I quote the following from his observations on migration, recently published in his work on 'Wild Norway.'

"Comparatively speaking, nothing whatever is humanly visible of migration at sea. Every voyage some few belated land-birds, singly, or in twos and threes, will seek refuge on one's steamer. But what do such scarce and casual appearances amount to? Nothing. The birds seen are merely stragglers, lost wanderers fallen out of the ranks of the migrating millions that are *not* seen. The numbers seen bear absolutely no appreciable relation to the vast sum-total of migration. They are interesting as indices of what is passing beyond our sight, but that is all.

"Consider what number of summer-birds are required to populate the one thousand two hundred miles of Norway alone. From the Naze to North Cape, not a wooded valley nor birch-clad slope of the fjeld, but is vocal with the melody of summer songsters. The aggregate must count up

into a tangle of millions. Yet who has ever seen them come? True, they may not all cross the North Sea; but who has seen the Swallows and Willow-wrens arrive in England, and *they* must cross the Channel? Has migration ever been seen in full swing by daylight? I mean the actual process of migration, as distinguished from mere evidences of its progress. Sitting, on mild November nights, in my garden at Roker, with nothing but the North Sea between me and the fjelds of Norway, or the sand-dunes of Jutland, I have listened to the single pipe of the Red-wings (and less often to the note of Field-fares, which are more silent) as they 'made the land' between ten and eleven o'clock. These birds presumably had left the opposite shore at dusk that evening, and had covered some three hundred and fifty miles in five or six hours. No one sees them start, no one witnesses their arrival. But of course the North Sea passage is merely exercise for strong-flying species. Is it the same with feebler kinds?

"In reply I will venture on a somewhat bold opinion. I am convinced that many birds of migratory habits are absolutely incapable, under normal conditions, of flying three hundred miles, or anything like it. Among such I would include all short-winged Warblers, Chats, and Gold-crests, Quail, Landrail, etc. These birds are neither 'built nor engined' for long flights; in their normal lives they never undertake such flights, and I do not believe, under ordinary conditions, that they are capable of performing them. No one who has watched their feeble, flickering flight in mid-sea, can believe it. Yet, on the other hand, we have confronting us the solid fact that twice in every year these tiny creatures do traverse Europe from end to end. The solution I am neither learned enough nor clever enough to suggest: but it seems certain that some great facts or factors governing migration have been overlooked, or yet remain to be discovered.

"The fact that migration is never observed in daylight, and that known flight-lines cross great altitudes (ten thousand feet and upwards), point to these aërial movements being performed at heights, and perhaps at speeds, that have never fully been realized. Assuming that migration is carried on at altitudes of twenty-five or thirty thousand feet, it would follow that the conditions of air-resistance, buoyancy, etc., in a rarefied atmosphere, would there be entirely altered. What those altered conditions may be or their precise effect on flight, it must be for more scientific pens to define; but, in my view, it can only be by virtue of some such changes, assisted by the option of selecting favouring wind-strata, that the feebler and short-winged travellers can make their distances.

"An obvious advantage of high-level travelling would be the extension of the field of view. Allowing for the convexity of the earth, but not for mountains or other obstructions, the figures work out roughly as under—

Altitudes.	*Tangential extent of vision.*
25,000 feet	225 miles
30,000 feet	245 miles.

"Thus at the first-named altitude birds would, in daylight, see England long before leaving Norway; while at the higher level, when crossing Spain, they would see Biscay before sinking Africa.

"In doubting whether migration has been seen in actual progress, I do not wish to be taken literally, for I have myself occasionally witnessed it, but always in that limited and relative sense in which exceptions go to prove rules.

"Thus, in Southern Spain, in spring, I have observed whole hosts of Swallows to appear suddenly, as from the clouds. The plains, the marshes, the vineyards, or mud-flats swarm with them. One night they roost in thousands under your thatched eaves and in the trees hard by.

Before the morning's light every bird has gone. This may, perhaps, be explained by the assumption that migration is performed at altitudes determined by the height at which a favourite air-current is found; that, in this case, the air-current had ceased to flow, and (no other being found within available limits) the migration in question was necessarily suspended, awaiting a renewal of the required conditions. Fortunate birds to have the land beneath them. Should such suspension occur at sea, it would involve the destruction of the entire host.

"Except by aid derived from operation of physical laws, the nature and extent of which are unknown to me, and by taking advantage of 'trade wind' circulations in the upper air, I believe that migration is impossible for short-winged forms of sedentary habit, such as those above-named. But that aid, and those advantages, may vastly facilitate, and perhaps vastly accelerate, a process which is otherwise impossible. As to insects, there appears no evidence to prove that there exists any regular migration across the North Sea. Occasional irruptions—such as those of *Colias edusa* and of the Diamond-back moth—may be thus explained. But in most cases, I take it, insects seen in mid-sea are probably blown-away bands that, during some local inland migration, have been caught in an air-stratum too strong for their power of flight. Few—very few—of these will survive to cross the sea."

Experiments made by Mr. Frank M. Chapman in America, with a powerful telescope directed towards the moon, have demonstrated the fact that birds can be seen passing at night at an altitude of from one to five miles, and it was even thought that some of the species could be recognized, though the greater number were naturally indistinguishable.

It is, therefore, certain that a great deal remains to be done before we can pretend to know much about the

migration of birds, and hasty conclusions or summaries are to be deprecated. Nor must it be supposed that all migration is in a direct course from north to south, or from south to north, for even in Great Britain, as Mr. Eagle Clarke has observed, a great stream of migration sets in from east to west, in the autumn, across the narrowest portion of the North Sea, and further records of the passage of birds on the opposite shores of the Channel may explain much which at present it is difficult to understand. Even in the Arctic regions the migration of Ross's Gull (*Rhodostethia rosea*) appears to be more from east to west than from north to south, just as the journeys of the Black Redstart (*Ruticilla titys*) to our own shores seem to be in a similar direction. The same phenomenon is witnessed in the Mediterranean, where an east and west migration crosses the lines of the flight from north to south, just as it does in our higher latitudes, and will doubtless be found to do in other parts of the world, when the facts concerning the movements of species are more fully accumulated.

It must also be remembered that migration exists among species which inhabit the countries in the Southern Hemisphere. Thus in South America and in South Africa many species are known to breed in certain districts and to vanish in the cold season northward. In Australia the same fact has been noticed, but the migrations are apparently restricted to the confines of that great continent itself.

Partial migration exists in all probability everywhere, and though many species may not leave a country, they often shift their ground in winter-time, while it is certain that of our common species, like the Song-Thrush, the Robin, and the Pied Wagtail, a large number of individuals are strictly migratory and leave the country altogether.

The routes taken by some species would seem to suggest that they follow the course taken by their ancestors

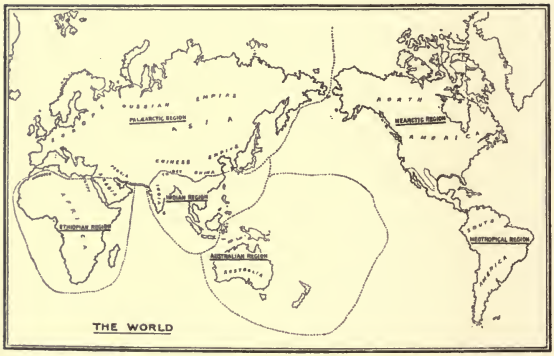
in times long past, when land-passages existed, which are now buried beneath the ocean. This may account for the arrival in winter of many species in Britain which come across the North Sea. It may also account for the way in which the Wheatear (*Saxicola œnanthe*) reaches Greenland every year, and for the occasional appearance of the Land-Rail and Peewit in North America, and of the Ruff in Barbados. The most wonderfully suggestive instance, however, is, to my mind, the occurrence of the two species of Red-footed Kestrel in Southern Africa. It is well known that in certain parts of Africa, during the northern winter, vast flocks of birds of prey are observed. They consist of Kites, Eagles, Hobbies, Kestrels, etc., and they follow the swarms of locusts, or appear in numbers where grass-fires take place. The European Red-footed Kestrel (*Erythropus vespertinus*) nests in South-eastern Europe, and is found in South-western Africa (Damara-land and the adjacent countries) in winter. In Eastern Siberia occurs the second species of Red-footed Kestrel (*Erythropus amurensis*), which is exactly like the European bird, excepting that the under wing-coverts are white instead of grey. It is, however, a perfectly distinct species, and winters in South Africa also, but in the more eastern districts, such as the Zambesi region. Occasionally the two species have been found inhabiting the same area in their winter quarters, but, as a rule, it would seem that they preserve there a similar eastern and western distribution to that which characterizes their breeding habitats. The question is—How does *Eyrthropus amurensis* reach its winter quarters? Not, apparently, by the Nile Valley and the country of the Great Lakes, which is the route apparently taken by the European Red-footed Kestrel, along with the Hobby and the Common Kestrel. It would appear, therefore, that it must cross the Indian Ocean in a direct south-westerly flight, and this is probably the case. A few stray examples

have been shot in the Indian Peninsula, and many have been also procured in Cachar, but my friend, Mr. J. Davidson, has recently found the species in flocks in Canara, which would be about the position from which the birds would "take off" before crossing the sea to Africa.

The above notes are principally those which served for my popular lecture on the 'Migration of Birds.' They express only a few thoughts on this most interesting subject, and several aspects of the question, notably that of the probable origin of the migratory instinct, are not touched upon. The study of migration is, as I said before, only in its infancy, and we know too little about it for any one to speak or write with much authority about the subject.

CHAPTER XIII

GEOGRAPHICAL DISTRIBUTION



The Collecting of Specimens—The six Zoo-geographical Regions of the World—Regions and Sub-Regions—Provinces and Sub-Provinces—Sclater's Scheme—Wallace's Amendments—Allen's Scheme—Dr. H. O. Forbes and the Lost Continent.

THE Geographical Distribution of Animals is one of the most interesting subjects that it is possible for a man to study. Like the Migration of Birds, it is a difficult and absorbing one, and very little is known of the facts, which are being added to day by day. As with the subject of

migration, too, a carefully prepared series of statistics will be necessary, before one can hope to generalize, and years must elapse before it will be possible to obtain these statistics. It must, therefore, be understood that only a general idea of the geographical distribution of birds is put forward in the present chapter. It is merely a guide to the final study that a zoologist undertakes, after he has mastered the details and the literature of the various species of birds.

The importance of interesting himself in the distribution of a species should be impressed on the beginner from the first. I suppose that all ornithologists commence much in the same way, by collecting birds' eggs; and indeed a properly formed collection of the latter, with each egg bearing its own history on the shell, is very instructive; but it must always be remembered that every egg in a boy's collection should be, like Cæsar's wife, "above suspicion," and that he should know for certain every detail connected with the finding of each nest, while he must also be sure of the identity of the birds which laid the eggs. It would astonish some of the boys of to-day, if they could see the collecting-diaries kept by some of our greatest living ornithologists when they were young. No point was considered too unimportant for record, and it is this precise method of noting facts which has distinguished their career in after-life, and has been the means of giving us the splendid series of observations on birds which are such a credit to British science. I have already alluded (p. 325) to the band of workers to whom in this country we owe so much, and I would only here emphasize the necessity for every young beginner to follow the method of work inculcated by these great ornithologists. The same care must be shown in collecting the skins of birds. Too much pains cannot be taken with the preparation of the skins, and here science owes a great debt to American zoologists,

whose method of beautiful preservation has caused quite a revolution in the art of taxidermy during recent years. On this point the works of Professor Elliot Coues may be studied with advantage by every student, and there are many excellent little manuals on the subject of taxidermy within the reach of every school-boy. I am only mentioning this incidentally, as I want to impress on everybody who makes a collection the fact that it is better to begin the study of natural history on a correct basis, and also that it is just as easy to make a good skin of a bird as a bad one. If a specimen is worth preserving, it should always be done in the best possible manner, otherwise it is a pity to have taken the life of the poor creature at all. It is on these carefully-made collections that the study of geographical distribution rests, and therefore every specimen, be the animal ever so common, should be labelled with the utmost care, particulars being given of the sex, locality, date of capture, altitude, etc., as it is only by a gradual accumulation of these data that we shall ever arrive at just conclusions as to distribution.

While giving the above advice, I may also strongly urge upon all young naturalists not to dwarf their studies by contenting themselves with the mere accumulation of British specimens. The study of British Birds is in itself interesting enough, but Great Britain forms but a small portion of Europe, which again is but a part of the Palæarctic Region, and therefore study should be progressive, from that of the species of one's own neighbourhood, to those of the county, the province, the kingdom, the continent, and finally the Zoological Region. Then indeed the study of animals becomes an absorbing one, and will never be forsaken by a carefully-trained student.

To understand, however, what is meant by geographical distribution, it is necessary to remember that the political divisions of the earth are not necessarily the natural ones.

Throughout the present work I have been obliged to speak of "Europe" and the other great Continents by their popularly-known names, but it has been "pain and grief" to me to have to do so, and I hope that the time is not far distant when every one interested in natural history will understand what is meant by the "Palæarctic" and other Regions of zoologists.

It was in 1858 that Dr. P. L. Sclater proposed the names by which the six great regions of the globe are known to naturalists of the present day. They are (A) the Palæarctic Region, (B) the Ethiopian Region, (C) the Indian Region, (D) the Australian Region, (E) the Nearctic Region, (F) the Neotropical Region. A few changes in this nomenclature have been suggested by subsequent writers, such as the substitution of "Oriental" Region for the "Indian" Region by Dr. A. R. Wallace, but by general consensus of opinion Dr. Sclater's names are employed by the great mass of writers.

In the present work I am writing only of the geographical distribution of *Birds*, as it seems to me always best to treat of one class of animals at a time, but it must be remembered that the above-named natural regions were separated not from a consideration of the birds alone, but from that of other animals as well, and many good books on the subject have been written, notably the standard work of Dr. A. R. Wallace on the "Geographical Distribution of Animals."

Judging from our present knowledge of the ranges of the birds, the six Zoological Regions of the Globe appear to be perfectly natural ones. There is a great difference in the richness of these different areas, South America being much more prolific in Avian types than any other portion of the world, while the Palæarctic and Nearctic Regions show less striking characteristics than the others.

A. THE PALÆARCTIC REGION.

This embraces the whole of Europe and Northern Asia, and its southern limit corresponds nearly with that of the 30th parallel of N. Latitude. There is considerable affinity between its birds and those of the Nearctic Region, and it contains but few genera which can be said to be characteristic of its vast expanse. It is a land of Grouse and Pheasants, and the Capercailies (*Tetrao*) are one of the principal types, while most of the true Pheasants (*Phasianus*), of which our Common Pheasant (*P. colchicus*) is an example, are confined within its limits.

I. THE ARCTIC SUB-REGION.

This may roughly be described as comprising the land above the Arctic Circle, with the northern islands, such as Kolguev, Novaya Zemlya, Spitsbergen, Franz Josef Land, etc. It extends to the southward of the Arctic Circle in Central Siberia, and includes the mountain districts of Scandinavia. It is the home of several characteristic species, such as the Gyr-Falcon (*Hierofalco gyrfalco*), the Hawk Owl (*Surnia ulula*), Steller's Eider Duck (*Somateria stelleri*), the Snowy Owl (*Nyctea nyctea*), and the Snow Bunting (*Plectrophenax nivalis*), while many Sea-birds, such as the Little Auk (*Alle alle*) and Brünnich's Guillemot (*Uria bruennichi*) nest only within this area, as do Bewick's Swan (*Cygnus bewicki*) and several species of Wading-birds, like the Knot (*Tringa canutus*) and the Curlew Sandpiper (*Ancylochilus subarquatus*).

II. THE EURASIAN SUB-REGION.

This Sub-Region includes the rest of Europe above the line of the Alps and Carpathians to the Caspian Sea, with

most of Central Asia and Siberia to the Pacific at about Lat. 55°. It consists of two Provinces, viz.—

A. The European Province.

To this belongs the whole of Northern and Central Europe, as defined above, and Central Siberia as far as the valley of the Lena. The Bearded Reedling of our Norfolk Broads (*Calamophilus biarmicus*) is one of the characteristic forms, but numbers of species do not wander outside the limits of this Province. The Ural Mountains, which have been generally looked upon as the boundary of the European Avifauna, are no boundary at all, and few species of birds seem thus to regard it. Whether the Yenesei or the Lena constitutes the eastern limit of the European Province can only be determined when we know more of the birds which inhabit the valley of the last-named river. Many species of European birds apparently do not extend beyond the Yenesei Valley, and in Central Siberia there is probably a distinct natural Province, judging from many of its birds. Thus the Starlings (*Sturnus*) are represented in the European Province by our common species, *Sturnus vulgaris*, but in Central Siberia its place is taken by *Sturnus menzbieri*, while no true *Sturnus* is found beyond the district of Lake Baikal. The Blue-headed Wagtail of Europe (*Motacilla flava*) is represented on the Yenesei by a paler species (*M. beema*), and the Hooded Crow (*Corone sharpii*) is again a paler form of our European Hooded Crow (*C. cornix*). There are also many other representative species and an infusion of peculiar forms in Central Siberia which may ultimately warrant the recognition of a third Province in our Eurasian Sub-Region, but at present the data are wanting, from which to found a decisive conclusion.

B. The East Siberian Province.

This consists of Eastern Siberia from the region of Lake Baikal to the Pacific, and includes Kamtchatka. It extends north of the Arctic Circle to nearly 70° N. Lat., and to the southward to about Lat. 55°. The birds which inhabit this province are many of them Eastern representatives of European forms.

III. THE MEDITERRANEO-ASIATIC SUB-REGION.

This includes the Mediterranean countries south of the Alps and Carpathians, and extends through Persia and Central Asia, and includes the whole of Tibet. The exact boundaries between this Sub-Region and the Manchurian are not well defined, as there is so much yet to be learnt respecting the ornithology of Eastern Asia.

a. The Mediterranean Province.

Southern Europe contains a number of species peculiar to the Mediterranean countries. Several Chats (*Saxicola*) and *Sylviidæ*, such as Marmora's Warbler (*Melizophilus sardus*), the Rufous Warbler (*Aëdon galactodes*), Bonelli's Warbler (*Phylloscopus bonellii*) are peculiar to this area, and there are also found within its limits Sand-Grouse (*Pterocles*), while there are also two species of Black-headed Nuthatch (*Sitta whiteheadi* of Corsica, and *S. krueperi* of Asia Minor), as well as numerous representative forms of Tits, Buntings, Larks (including all the members of the genus *Chersophilus*), etc. Such migration as takes place in this Province seems to be from east to west, as is shown by the breeding of the Rose-coloured Starling (*Pastor roseus*), and the Black-headed Bunting (*Euspiza melanocephala*) within its area, and their retirement to North-western India to winter.

b. The Mediterraneo-Persic Province.

From the eastern portion of the Mediterranean this Province extends through Central Asia to about Long. 70°, where it meets the Mongolian Province. This district is characterized by a number of desert species, and at least one remarkable genus, that of the Desert Choughs (*Podoces*), is peculiar to it. Although Palestine and Syria are included in this province, the occurrence of the Indian Fishing Owl (*Ketupa*), of a Sun-bird (*Cinnyris osea*), and a Glossy Starling (*Hagiopsar tristrami*) of an African type, must not be overlooked. The confines of this Province reach to Baluchistan and the frontier of North-western India.

c. The Mongolian Province.

Within the limits of this Province are found many representative forms of European species, but also of Indian and Chinese birds as well. Its boundaries, for lack of knowledge, cannot be precisely defined as yet.

IV. THE MANCHURIAN SUB-REGION.

From the Yangtze Valley north to about 55° N. Lat., and eastwards to about Long. 100°, there are found so many remarkable forms of birds that a natural sub-region must be assigned to the area they inhabit. Here many of our European species are replaced by distinct forms, our Rook (*Trypanocorax frugilegus*) by the Chinese Rook (*T. pastinator*), our Jackdaw (*Colœus monedula*) by the White-necked Jackdaw (*C. dauricus*); while many tropical forms, such as the Black-headed Kingfisher (*Halcyon pileata*), the Blue Roller (*Eurystomus calonyx*), and members of the peculiar Eastern genera *Pericrocotus*, *Suthora*, etc., breed within its limits. It is mainly from this Province and from the East Siberian Province that emanates the great eastern

stream of migration which extends in winter to Southern China, the Philippines, and the Moluccas.

V. THE HIMALO-CAUCASIAN SUB-REGION.

In the higher ranges of the Himalayas, above 8000 feet elevation, we find several peculiar species and genera of birds which do not occur at lower altitudes, and I recognize this Sub-Region as one of great importance. It is the habitat of the Snow-Cocks (*Tetraogallus*), and the Hill Partridge (*Lerwa*), and the distribution of the former genus leads me to include in it the lofty ranges of the Altai Mountains, as well as the mountains of Northern Persia, the Caucasus and Asia Minor, in all of which the genus *Tetraogallus* occurs. This Sub-Region is also remarkable for certain species of Passerine Birds, and when accurate statistics are available, will, I believe, be found to be of great importance.

B. THE ETHIOPIAN REGION.

Africa, below the Sahara, and Madagascar, with perhaps the whole of Arabia, constitute the Ethiopian Region. At first sight this would appear to be a perfectly natural area, and so it is, but its limits on the north and east are not yet well defined, as any one can understand from a glance at the map of Africa.

I. THE SAHARAN SUB-REGION.

This Sub-Region may as well at once be stated to be a blank. We know nothing about it. When Denham and Clapperton crossed the Sahara, they brought home to the British Museum a few large birds, such as a Griffon Vulture (*Gyps fulvus*), which taught us nothing. Where the carcass is, there will the Griffons be gathered together. If these brave men, the pioneers of African travel,

had but lived in the present epoch, and had collected specimens of small birds to the bulk of that Griffon's skin, which must have been such a trouble to them to transport, we should now know the secret of the Great Sahara and what birds flourish there. The French have held the Western Soudan for many years, but as regards Ornithology at least, I am not aware of one single fact that has been recorded for our benefit. The same may be said with truth of most of our British expeditions, but it is quite another thing when one speaks of Germany. The birds of all the German colonies from Togo-land to the Victoria Nyanza have been scientifically collected, and the world has had the advantage of my colleague Dr. Reichenow's excellent Memoirs. The same can be said with regard to the Cameroons, whence the Berlin Museum has received valuable collections from Dr. Zenker, containing numbers of new species, at present unrepresented in our National Museum. In South-western Africa the Germans show the same activity, while a work of the highest importance on the Natural History of German East Africa has been issued by the Berlin Museum. One of the first results of surrendering Madagascar to the French has been the closing of this interesting field of research to British Zoologists, while the difficulty of collecting in any part of Africa other than British is notorious. It is nothing less than a national disgrace, that where the *Pax Britannica* prevails, the first to take advantage of our conquests are the naturalists of other countries, and but for the interest taken in Natural History by some of our British officers, like Mr. Frederick J. Jackson, Dr. Hinde, Sir Harry Johnston, and other men imbued with the British *esprit de corps*, the entire scientific results of our extension of empire would have been reaped by the enterprising Germans.

Thus I have to record that nothing certain is known of the natural history of the Sahara Sub-Region, except on its

northern border, and here we meet with a desert Avifauna, abounding in Larks and Chats, from which we may gather that a natural Sub-Region there exists, and probably extends from the confines of the Egyptian Delta and Nubia eastwards as far as the Cape Verde Islands.

II. THE SOUDANESE SUB-REGION.

By this Sub-Region I indicate the whole of the country lying to the south of the Sahara, extending northwards to Nubia below the Nile Delta and including what is known of Arabia. A vast portion of this Sub-Region is unexplored, and its Ornithology is unknown, but there is evidently a connection between the Avifauna of Senegambia and that of Abyssinia, evidenced by the occurrence in both countries of such birds as the Abyssinian Roller (*Coracias abyssinica*), and by certain of the Game-birds. It is a country of Francolins, Quails, and Bustards, and on the Gold Coast near Accrà, there seems to be a break in the continuity of the forest-region, and the Soudanese fauna reaches to the coast. Otherwise it is confined to the interior and is shut off by the forest-region aforesaid. Many species of birds are peculiar to this Soudanese Sub-Region, which also constitutes the winter-home of many of our European migrants.

III. THE WEST AFRICAN SUB-REGION.

From the forest districts of Southern Senegambia to the Gold Coast this Sub-Region is well marked, and after the small gap caused by the interposition of the Soudanese Sub-Region at Accrà, the West African Sub-Region extends, unbroken to any large extent, to the Cameroons, Gaboon, and the Congo, as far as the River Coanza in Angola, and probably in isolated patches, even to the south of the latter river. Inland this natural region extends throughout the Congo Basin to the western watershed of the Nile, as has

been proved by the collections made by Emin Pasha, Mr. F. J. Jackson, Mr. Oscar Neumann, and Dr. Stuhlmann. Perhaps the first to bring this fact home to the notice of ornithologists was Mr. F. Bohndorff, who made a collection of birds in the Niam-niam country, though the late Baron von Henglin had already described from the Gazelle river many species which showed the presence of a West African element in the Upper Nile districts. Bohndorff had been one of Gordon's lieutenants in the Soudan, had been in charge of Sobat, had accompanied Dr. Junker on his expedition to Equatorial Africa, and on his way back to Egypt he met his old commander Gordon in the middle of the Korusko desert, as the latter was hurrying to meet his fate at Khartoum. Bohndorff was, in fact, one of the last Europeans to speak with our national hero.

When he entered the bird-room at the Natural History Museum, he was accompanied by his faithful black servant Yuma, who had been with him through all his troubles in the Niam-niam country, and had come with Bohndorff down the Nile, when, knowing nothing of the Mahdi and his insurrection, they had been surprised to find their steamer fired on as they made their way to Khartoum. The box which Yuma carried on his head was opened in the bird-room, and I shall never forget my surprise at finding that the birds it contained were *West* African, and a new idea as to the geographical distribution of African birds was unfolded. A few days afterwards the collection was exhibited at a meeting of the Linnæan Society, when Bohndorff and his servant Yuma appeared, the latter in European dress, which caused me to quote to this august assembly a few lines of Mr. W. S. Gilbert's :—

> "And though the dress he's made him don
> Looks awkwardly this man upon,
> It is a great improvement on
> The one he found him in."

The West African Sub-Region is an extremely interesting one, from the point of view of the Zoologist. It is the land of the Gorilla, the Chimpanzee, and the Kooloo-Kamba, one of whose race has become immortalized as "Sally" in the Zoological Gardens. Numbers of genera and species of birds are peculiar to this Sub-Region, and above all others, it contains certain species of a Malayan type, the nearest allies of which are to be sought for in the Indian and Indo-Malayan regions. Thus we find in West Africa species of the Malayan genus *Turdinus*, one of the Babbling-Thrushes, a *Pitta*, and a *Baza*.

The Ant-Thrushes (*Pittidæ*) are an Eastern type of bird, occurring in the Indian Peninsula and the Himalayas eastwards to China and Formosa, and represented by numerous species throughout the Malayan Archipelago as far as New Guinea and Australia. The Angola Pitta (*P. angolensis*) occurs throughout the West African Sub-Region, but has no kith or kin in any other part of the Ethiopian Region, and finds no relation whatever till we come to the Indian Peninsula and Ceylon. The Cuckoo-Falcon of West Africa (*Baza cuculoides*) is an inhabitant of the entire forest-region as above defined.

The genus *Baza* has a distribution of the highest interest, for in the Ethiopian Region we find the West African *Baza cuculoides*, replaced in S. E. Africa (from Natal to Nyasaland) by *B. verreauxi*, and in Madagascar by *B. madagascariensis*. Then we cross the Indian Ocean, and take up the distribution of the genus, finding in the hills of Ceylon *B. lophotes*, which also inhabits the Eastern Himalayas and the Burmese countries. Thence throughout the islands of the Malay Archipelago even to Northern Australia are distributed quite a number of species of Cuckoo-Falcons, each of them restricted in habitat to a single island or group of islands.

Then, again, in West Africa we find many representatives

of *Turdinus*, a Malayan group of small brown Babbling-Thrushes, and even in ordinary forms like Kingfishers, we meet with *Halcyon badia*, the Chestnut Kingfisher, which has no affinity with any other African species of *Halcyon*, but finds its ally in the Indian species, *Halcyon smyrnensis*, and the Philippine *H. gularis*. Peculiar forms of Flower-peckers (*Dicæidæ*), a family of birds principally Indian and Malayan, also occur in West Africa.

IV. THE ABYSSINIAN SUB-REGION.

Many characteristic forms of Mammals and Birds constitute the natural elements for the recognition of a separate Sub-Region in North-eastern Africa, but it must be admitted that its limits are, from want of knowledge, impossible to define exactly at present, as we do not know the extent on its western frontier of the Soudanese Sub-Region, nor on its southern frontier of the encroachments of the East African Sub-Region. Many birds supposed to be exclusively Abyssinian have recently been found in Equatorial Africa, and much closer study and an examination of larger collections of specimens will be necessary before we can hope to define the frontiers of the Abyssinian and West African Sub-Regions.

V. THE EAST AFRICAN SUB-REGION.

Although possessing many peculiar species of birds, this Sub-Region requires the accumulation of much more material than we possess at present for the exact definition of its boundaries. Roughly speaking, it seems to extend from the north of the Zambesi to Abyssinia, or at least Shoa, westwards to the Nile watershed and the chain of the Great Lakes, and includes Somali-land. New species of birds have, however, been discovered in the latter country in recent years, which show more affinity to species from

South Africa than to those from the more adjacent lands of Abyssinia and East Africa proper.

VI. THE SOUTH AFRICAN SUB-REGION.

When I first indicated this Sub-Region as a natural one, I was inclined to regard its northern boundaries as the Coanza river on the west, and the Zambesi river on the east. I have, however, lately been forced to admit that the Zambesi seems to form no natural boundary, and the limits of the South African Sub-Region apparently reach the line of 10° N. Lat. and may even extend to the vicinity of the Victoria Nyanza, as such typical forms as *Chera progne* (the Long-tailed Whydah Bird) and *Pyromelana taha* (the Taha Weaver-Bird) have been found in the swamps of Equatorial Africa.

A. The Cape Province.

This embraces a small area, and includes the Cape Colony to the south of the Orange River and the Karroo. In the latter arid district several peculiar genera and species of Larks are found, and the Cape Province has many characteristic species not found outside its limits.

B. The Natalese Province.

In the eastern districts of the Cape Colony the Fauna is decidedly different, and shows a peculiar element of its own. From the neighbourhood of Grahamstown and the Peri Bush, near Kingwilliamstown, occur many representative species which extend their range through Natal and the Eastern Transvaal to the Zambesi, or even to Eastern Damara-land. In the latter district a more desert aspect supervenes, and many widely-distributed South African species here exhibit a paler colouration in consequence.

VII. THE CAMEROONIAN SUB-REGION.

When the mountains of the Cameroons were first visited by the late Captain Burton, the few birds obtained by him revealed the existence of a peculiar Avifauna at high elevations, and this fact has been amply confirmed by the more recent explorations of Sir Harry Johnston and the German naturalist, Dr. Preuss, and others. The same phenomenon occurs in the mountains of Equatorial and Eastern Africa, and we find that above an altitude of some 3000 feet on Mt. Elgon, Mt. Kenia, Mt. Kilimanjaro, Mt. Zomba in Nyasa-land, and other mountainous regions, many quite peculiar birds exist and are found nowhere else. This fact was amply demonstrated by the collections made by Mr. F. J. Jackson during his celebrated exploration of Mount Elgon, and it has been confirmed by his subsequent work in the mountainous districts of Equatorial Africa. I have called this Sub-Region the "Cameroonian," because the particular element first discovered in these mountains seems to obtain at similar high altitudes in the isolated mountains of East Africa. A peculiar genus of Weaver-Finches, *Cryptospiza*, occurs in the Cameroons, in the mountains of Shoa, and re-appears in those of Nyasa-land, and it has even been found that in some instances the Birds and Butterflies of Mt. Elgon and the high Cameroons are actually identical. There seems, indeed, to be a peculiar Avifauna on those high elevations of the African Continent, differing from that of the lower country, and even preserving a certain Indian element. A characteristic species of the Cameroonian Sub-Region is *Pinarochroa*, which is only found in the highest altitudes, up to 11,000 feet.

VIII. THE LEMURIAN SUB-REGION.

Dr. Sclater has given this name to Madagascar and the neighbouring islands, but it would have been better to have called it the Mascarene Sub-Region, though the former name is so well known among zoologists that to change it would cause confusion, especially as the rule that a name once given should always remain, is an axiom with those who adhere to the law of priority. The name of the Sub-Region is founded on the presence of those furry aberrant Monkeys, known as Lemurs, which are characteristic of Madagascar. Among the birds we notice as peculiar to this Sub-Region curious forms of Ground-Rollers (*Atelornis, Brachypteracias*), the Kirombos (*Leptosoma*), *Eutriorchis* among the Hawks, several peculiar forms of Warblers and Flycatchers, and the Madagascar Kagu (*Mesites*), besides numbers of other remarkable species. Within the area of this well-defined Sub-Region lay the home of the Dodo and the Solitaire, the Crested Starling of Réunion (*Fregilupus*), and other interesting birds now extinct.

Before quitting the subject of the Ethiopian Region it is well to notice that there are a number of genera common to both the Ethiopian and Indian Regions, and some, like the Paradise Flycatchers (*Terpsiphone*), are also found in Madagascar and the Mascarene Islands. I have already mentioned *Baza, Pitta*, and *Turdinus* as genera common to the Ethiopian and Indian Regions, and many more can be added, *Eurystomus, Cryptolopha, Alcippe, Schœnicola*, etc., the discussion of which would occupy more space than can be given in a little work like the present.

One of the most remarkable instances of the isolated distribution of a genus of birds is seen in the Falconets (*Poliohierax*), one species of which, *P. semitorquatus*, inhabits Africa, and the second species, *P. insignis*, is found in the Burmese Provinces. The peculiar fact about these

little Hawks is that the male has a grey back and the female a chestnut one, a difference in the colour of the sexes which is only found in this particular genus, and yet we find this difference of plumage existing equally in the African and the Burmese species of Falconet. With this curious distribution of an Accipitrine genus must be considered also that of another genus of Hawks (*Erythropus*), already alluded to (p. 346).

C. THE INDIAN REGION.

This includes the greater part of Southern Asia from the line of the Himalayas and the Yangtze river in China. The Western limit is about 55° E. Long. where the Palæarctic and Indian Regions find a frontier. There are apparently at least five natural Sub-Regions contained within the area of the Indian Region.

I. THE INDIAN PENINSULAR SUB-REGION.

Not many genera, but numbers of species are characteristic of this Sub-Region, but throughout there runs a note of affinity to species which inhabit the Ethiopian Region, and we find many Indian genera represented in the latter, especially among the Babbling-Thrushes (*Timeliidæ*), and the Grass-Warblers (*Cisticola*, *Prinia*, etc.), Larks (*Alaudidæ*) and Pipits (*Anthus*).

II. THE INDO-CHINESE SUB-REGION.

Embraces China south of the Yangtze, Siam, Cambodia, and the Burmese Provinces. The peculiar species are mostly representatives of those found in the Indian Peninsular Sub-Region.

III. THE HIMALO-CHINESE SUB-REGION.

This is characterized principally by species of birds which occur at a high elevation in the Himalayas, and are found at similar heights in the mountains of China. The most characteristic genus is probably that of the Horned Pheasants (*Tragopan*).

IV. THE INDO-MALAYAN SUB-REGION.

This is an equivalent of the Indian-Peninsular and Indo-Chinese Sub-Regions, and contains numbers of representative species. It includes the low lands of the Malayan Peninsula and the Indo-Malayan Islands, and has its eastern boundary in "Wallace's Line," which passes through the deep sea of the Straits of Lombock, gives Bali, Borneo, and the Philippines to the Indo-Malayan Sub-Region, and Lombock and Celebes to the Australian Region.

The Indo-Malayan Sub-Region has most of the genera possessed by the Indian-Peninsular and Indo-Chinese Sub-Regions. Pittas are more abundant, the Fairy Blue-birds (*Irena*) are represented by several species, numbers of peculiar species of Timeliine Birds (*Timeliidæ*) flourish, and even distinct genera of the latter Family are characteristic of the Sub-Region. Many Pheasants are Indo-Malayan, but the most striking of the Game-birds found in the area are undoubtedly the two species of *Argus* Pheasants, which are peculiar to the Sub-Region.

V. THE HIMALO-MALAYAN SUB-REGION.

The high mountain ranges of the Indo-Malayan and the Indo-Chinese Sub-Regions contain an Avifauna which differs considerably from that of the lower countries, and exhibits a pronounced Himalayan element. Thus many genera,

such as *Cryptolopha*, *Corythocichla*, *Turdinulus*, *Hemixus*, *Cissa*, *Batrachostomus*, are characteristic of this mountain region, which corresponds in great manner to the Cameroonian Sub-Region of the African continent. To this Himalo-Malayan Sub-Region belong the mountains of Ceylon and the hills of Southern India, and the affinity of the Avifauna of the high mountains of the Malayan Peninsula with that of Sikhim on the one hand, and with Kina Balu and Dulit in N. W. Borneo, as well as the high ranges of Sumatra and Java, has already been pointed out by me, while the recent explorations of Mr. John Whitehead in the mountains of many of the Philippine Islands tend to prove that the higher regions of the latter have a precisely similar Avifauna to that of Borneo, possessing peculiar species of *Horeites*, *Androphilus*, *Stoparola*, *Turdinus*, etc. The genus *Androphilus* was first described by me from Kina Balu, where it was obtained by Mr. John Whitehead, who has since discovered another allied form, *Pseudotharrhaleus*, in the mountains of Luzon.

So many of the ranges of the Himalo-Malayan Sub-Region still remain to be explored that we may confidently count on the discovery of many new species of birds which will throw additional light on the Avifauna of this area, but I fully expect that any new discoveries will but confirm the character of this mountain Sub-Region as being an outlying portion of the great Himalayan chain. It should be noticed that in the Himalayas themselves there exists a Palæarctic element at a great elevation, indicated by the presence of Crossbills (*Loxia*) and a number of species of Bullfinches (*Pyrrhula*), the latter being essentially a Palæarctic form. It is, therefore, of the highest interest that Mr. Whitehead discovered species of a Crossbill and a Bullfinch in the high mountains of the island of Luzon in the Philippines.

D. THE AUSTRALIAN REGION.

This embraces the continent of Australia and the whole of the islands lying to the east of "Wallace's Line." It embraces seven Sub-Regions, all of which appear to be well defined.

I. THE CELEBEAN SUB-REGION.

This Sub-Region includes the island of Celebes and some of the adjoining islands, such as the Sula group, the Tojian Islands, Salayer, etc. Celebes is a most interesting island, as we see from the wonderful monograph of its Avifauna recently published by Dr. Meyer and Mr. Wiglesworth. It is a kind of debatable land, for although there is a very strong Australian element, the Indian features of its Avifauna are also very strongly pronounced, while at the same time it has many birds peculiar to its area. *Charitornis* and *Streptocitta* are among the Passerine genera, and these two forms of Tree-Starling are not found outside the Celebesian Sub-Region. *Ceycopsis* and *Monachalcyon* among the Kingfishers, *Megacephalum* among the Megapodes, are also other characteristic forms, and there are many others. Curiously enough, too, there is a certain affinity between the Celebesian Avifauna and that of Madagascar, and specimens of a Tufted Owl (*Scops rutilus*) can scarcely be distinguished from these widely-separated localities. Recent explorations in the high mountains of the island have revealed a distinct Himalayan element as existing there in the form of *Androphilus* and such-like genera, while it is remarkable that North and South Celebes have several forms peculiar to each of these districts. Thus in North Celebes we find *Streptocitta torquata* and *Stoparola septentrionalis* represented in South Celebes by *Streptocitta*

albicollis and *Stoparola meridionalis*. Celebes is also remarkable as being the eastern limit reached by Woodpeckers and Monkeys.

II. THE MOLUCCAN SUB-REGION.

This includes the Molucca Islands, such as Batchian, Halmahéra, Ternate, Bourou, Ceram, Amboina, the Timor group, etc. These are characterized by a multitude of Honey-suckers (*Meliphagidæ*), by Thickheads (*Pachycephala*), both Australian features, while many forms are peculiar, such as *Eulipoa* among the Megapodes, *Semioptera* and *Lycocorax* among the Birds of Paradise, etc. In Timor, however, and the adjacent islands Mr. Everett has recently found Himalo-Malayan forms, such as *Orthnocichla everetti* in South Flores.

III. THE PAPUAN SUB-REGION.

New Guinea forms the principal portion of this Sub-Region, which includes the outlying islands to the westward, such as Salwati, Waigiou, Batanta, the Aru Islands, and on the east it extends to the Solomon Islands, while as regards ornithology, the Cape York Peninsula must be included in the Papuan area; for it possesses a species of *Casuarius*, which is eminently a Papuan genus. Of the multitude of other genera and species which are characteristic of the Sub-Region, it is unnecessary to go into detail, as they are of such a very pronounced and distinct type. Nearly all the *Paradiseidæ*, or Birds of Paradise, are confined to its area, and the extension of the range of the Manucodes (*Phonygama*) and the Rifle-birds of the genus *Craspedophora* into the Cape York Peninsula, only emphasizes the fact that the latter portion of the Australian continent has a Papuan element in its Avifauna.

IV. THE AUSTRALIAN SUB-REGION.

Although divided into Provinces by Dr. Pierson Ramsay, each of which contains peculiar representative birds, there is no need on this occasion to go into the question of the subdivision of this Sub-Region, which is a very well-marked one, containing such wonderful forms as *Menura* (p. 75), *Talegallus* (p. 24), *Ptilonorhynchus* (p. 129), and hosts of others. Tasmania, though possessing a few representative forms of its own, is an integral part of the Australian Sub-Region.

V. THE NEW ZEALAND SUB-REGION.

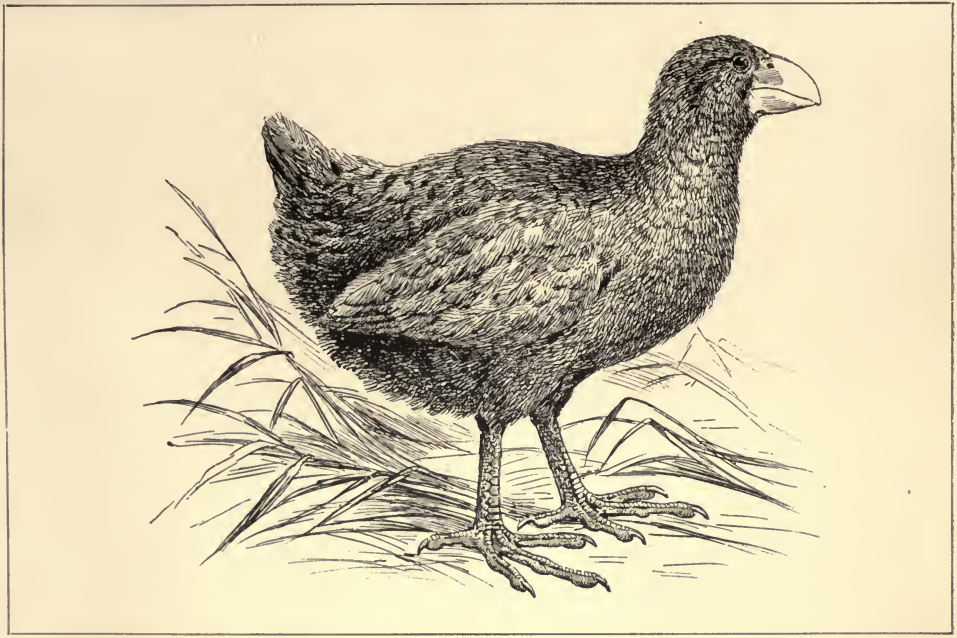
This is an area of such wonderful forms of bird-life that it might well be separated as a distinct Region. It is the home of the Kiwis (p. 15), the Huia (p. 112), the *Notornis*, and many Passerine genera, *Certhiparus*, *Pogonornis*, *Creadion*, *Glaucopis*, etc.

VI. THE FIJIAN SUB-REGION.

To this Sub-Region belong the bulk of the Pacific Islands and New Caledonia. To the latter island is restricted the Kagu (*Rhinochetus jubatus*), that extraordinary bird (p. 253) which is allied to the *Mesites* of Madagascar and the Sun-Bittern (*Eurypyga*) of South America (p. 254). In the Fijian group of islands are many curious forms, and in Samoa we find the flightless Moorhen (*Pareudiastes*).

VII. THE HAWAIAN SUB-REGION.

The Sandwich Islands compose this Sub-Region, and it is scarcely necessary to dwell on the birds of this interesting area, for they are so peculiar that scarcely any of the



The Giant Gallinule of New Zealand (*Notornis mantelli*).

genera occur without the limits of the Sub-Region. There live the Mohos (*Drepanis*), and quite a number of other Passerine genera, such as *Heterorhynchus*, *Loxops*, *Himatione*, *Oreomyza*, etc.

E. THE NEARCTIC REGION.

As with the Palæarctic Region, there seem to be a number of Provinces which correspond in some degree with those of the latter Region, but there is this difference between them that, whereas in the Palæarctic Region little attempt has been made to define the limits of the various Provinces, in North America most careful work has been done, and the natural zoological divisions have been tabulated by Dr. C. Hart Merriam and Prof. J. J. Allen.

I. THE ARCTIC SUB-REGION.

This corresponds to the Arctic Sub-Region of the Old World, and the two together form a circumpolar Sub-Region. It is the home of the Greenland Gyr-Falcon (*Hierofalco candicans*), the Snowy Owl (*Nyctea nyctea*), Ross' Gull (*Rhodostethia rosea*), and it is within this area that the Knot (*Tringa canutus*) and the Sanderling (*Calidris arenaria*) breed, as well as many Ducks and Sea-fowl. The Snow-Bunting (*Plectrophenax nivalis*) is the most characteristic Passerine bird. The limit of this Sub-Region is from about the Arctic Circle on the west of North America, to about 50° N. Lat. on the coast of Labrador, and it includes the whole of Greenland. Two "faunæ" are recognized by Prof. Allen within its limits, viz. the Barren Grounds and the Alaskan-Arctic.

II. THE COLD TEMPERATE SUB-REGION.

Professor Allen divides the continent of North America into two main Sub-Regions, which he calls the "Cold" and the "Warm" Temperate Realms. They are further subdivided by him in the manner detailed below.

It has been proposed by Prof. Alfred Newton in his 'Dictionary of Birds' that the Palæarctic and Nearctic Regions should be united under the one heading of the "Holarctic" Region. Prof. Allen would unite them as a "Warm Temperate Realm," but, although it is probable that further research may prove my Eurasian Sub-Region to be of equal value with Prof. Allen's Cold Temperate Region in North America, it seems to me to be a mistake to unite these two portions of the globe as if they constituted a single natural zoological area. In Mammals, no doubt, there are many forms, which, if not strictly identical, are very closely allied, and through the Cold Temperate Sub-Region of America extend numbers of Grouse which represent those of our own Palæarctic Region, while some Passerine Birds, such as the Waxwing (*Ampelis garrulus*) and our Shore-Lark (*Otocorys alpestris*), occur and breed in both the Nearctic and Palæarctic Regions, and Tits (*Parus*), Creepers (*Certhia*), Wrens (*Anorthura*), etc., are common to both of them, and exist in large numbers of species. But when all that has been considered, the Nearctic Region is still, in my opinion, from the general stamp of its Avifauna, quite unlike that of the Palæarctic Region, which has no Hang-nests (*Icteridæ*), Greenlets (*Vireonidæ*), Coloured Warblers (*Mniotiltidæ*), and no Tanagers (*Tanagridæ*). The presence of the numerous species which North America possesses in these four families alone is sufficient to characterize the Avifauna of the Nearctic Region as distinct from that of the Palæarctic. Besides the plurality of Grouse, which is a feature of the Cold Temperate Sub-

Region, there are numbers of species which do not extend beyond its area, as has been pointed out by Prof. Allen in the 'Auk' for 1893 (p. 125). There are four Provinces within the limits of the Sub-Region, each characterized by peculiar species of Mammals and Birds.

A. The Aleutian Province.
B. The Sitkan Province.

Both the above are of small extent.

C. The Hudsonian Province.
D. The Canadian Province.

III. THE WARM TEMPERATE SUB-REGION.

This includes the rest of the Nearctic Region to the borders of the Neotropical Region. It is divided by Prof. Allen into two provinces, the "Humid" and the "Arid," which are again sub-divided.

A. The Humid Province.

In this Province is embraced warm temperate North America from the sea-coast to about W. Long. 100°, excepting the Appalachian Mountains which belong, like the Rocky Mountains, to the Cold Temperate Sub-Region. Prof. Allen gives as characteristic of this Province, such genera as *Elanoides* (the Swallow-tailed Kite), *Dolichonyx* (the Rice-bird), and many other genera of Passerine birds. The following Sub-Provinces or "Faunæ" are recognized by Dr. Hart Merriam and Prof. Allen—

a. The Alleghanian Sub-Province.
b. The Austro-riparian Sub-Province.

The Austro-riparian Sub-Province is divided by Prof. Allen into two "Faunæ," the Carolinian Fauna, and the Louisianian Fauna.

B. The Arid Province.

This Province includes the southern part of North America from about 50° N. Lat., and occupies a more western area than the Humid Province. The greater part of the Arid Province consists of plains and deserts, with an exceedingly dry climate. Prof. Allen gives some of the characteristic forms of birds as *Rhinogryphus* (Californian Vulture), Pygmy Owl (*Glaucidium*), Road-Runner (*Geococcyx*), etc.

a. The Campestrian Sub-Province.

This contains the greater part of the Great Plains, including those of the Saskatchewan, Columbia, and Snake rivers. Mr. Allen divides it into three districts, that of the "Great Plains," the "Great Basin," and the "Pacific Coast."

b. The Sonoran Sub-Province.

The limits of this Sub-Province have not been exactly defined, as more information is required regarding the Avifauna of some of the countries, but it reaches to about 38° N. Lat. and south to Lower California, and also includes all the table-land of Central Mexico. Prof. Allen thinks that the more tropical portion of North America may be divided into three Sub-Provinces or "Faunæ," viz. the Floridian, Tamaulipan, and the Saint Lucas.

F. THE NEOTROPICAL REGION.

This Region is the richest in bird-life of any part of the globe. Within its limits are found the Rheas (p. 17), the Tinamous (p. 16), the Toucans (*Rhamphastides*), the Puffbirds (*Buccones*), nearly all the Humming-birds (*Trochili*), the Curassows (*Craces*), and hundreds of peculiar genera and species.

I. THE ANTILLEAN SUB-REGION.

This consists of the West Indian Islands, to which many forms of birds are restricted, the most noteworthy being perhaps the Todies (Sub-Order *Todi*), of which the islands of Jamaica, Cuba, Porto Rico, and St. Domingo each contain a species. Several genera and species of Passerine Birds are also peculiar to this Sub-Region.

I. THE CENTRAL AMERICAN SUB-REGION.

This includes the whole of Central America from Mexico southwards to the Isthmus of Panama, leaving out the plateau of Central Mexico, which belongs to the Sonoran Sub-Province of the Nearctic Region. Mr. Osbert Salvin has pointed out that the Neotropical Avifauna reaches on the eastern side almost to the Rio Grande, following the line of the forest-country, so that Toucans, Motmots (p. 79), Tinamous, and Curassows reach nearly to the above-named river, and one species of Curassow, *Ortalis vetula*, actually extends into Southern Texas.

A. The Mexican Province.

This extends as far as Costa Rica, where a certain difference in the Avifauna is found, and the birds of the latter country have more affinity with those of Panama.

B. The Isthmian Province.

In Costa Rica and Panama there are several genera which do not occur in the Mexican Province, and there is a strong connection with the Ecuadorian Avifauna, several species from which find their northern range in Panama.

III. THE SUB-ANDEAN SUB-REGION.

Extends from the frontiers of Bolivia northward in a strip of country between the Amazonian Sub-Region, eastwards along the western bank of the Orinoco, including Trinidad, and Venezuela, as well as Ecuador, as far as Truxillo on the Pacific Coast.

V. THE AMAZONIAN SUB-REGION.

As its name implies, this Sub-Region embraces the whole system of the Amazons to Bolivia, and extends northwards so as to include Guiana and the country lying to the east of the Orinoco.

V. THE BRAZILIAN SUB-REGION.

This marches on the north with the Amazonian Sub-Region from Bolivia, and includes the whole of Brazil from about 5° S. Lat., as well as the whole of Argentina as far south as the Rio Negro of Patagonia.

VI. THE PATAGONIAN SUB-REGION.

To this Sub-Region belongs the whole of the Andean chain, with its outlying spurs in Colombia, and all the rest of South America, west of Mendoza and south of Bahia Blanca, down to Tierra del Fuego and the Falkland Islands. The great Condor (*Sarcorhamphus gryphus*) is a typical bird of this Sub-Region.

The above is but a slight sketch of the zoo-geographical regions of the earth, and the scope of the present work, as a *précis* of my lectures, does not allow of the publication of the necessary statistics which prove that there are ample facts to account for the definition of the various zoological areas of which I have been writing.

While on the subject of geographical distribution of animals, I should like to add a word or two with regard to an aspect of the subject which is intensely interesting. Dr. H. O. Forbes, the celebrated Malayan traveller, now the Director of Museums in Liverpool, was some years ago the Director of the Museum at Christchurch in New Zealand. When there, he paid a visit to the Chatham Islands, and obtained the sub-fossil remains of a flightless Rail (*Aphanapteryx hawkinsi*) of the same genus as the extinct flightless Rail of Mauritius. In the neighbouring island of Rodriguez formerly existed a Wood-hen (*Erythromachus*), closely allied to the Weka Rails or Wood-Hens of New Zealand (*Ocydromus*). The latter birds will to this day fight at anything red which is offered to them, and the same fact is recorded by Leguat of the Wood-hen of Rodriguez, which has been named *Erythromachus* or the "fighter of red" in consequence. In New Zealand existed within historical times the gigantic Moas, to which the extinct *Æpyornis* of Madagascar was nearly akin, while large Coots (*Fulica*), apparently identical, formerly lived in the Chatham Islands and Mauritius. Another connection between the Mascarene Region and the New Zealand Region is seen in the Passerine Birds, where the Huia (p. 112) of New Zealand is clearly a close ally of the extinct *Fregilupus* of Réunion.

The presence of these closely allied forms in such distant portions of the world is an argument in favour of a former connection between these land-areas, now separated by deep seas, and Dr. Forbes has brought forward a mass of evidence to show that there was probably not only a land-connection between these southern portions of the globe, but that, when the South Pole was tropical, the land extended over a vast area in the southern portion of the globe, and that a continuation of land existed which connected the now "Lost Continent" with South America,

Lemuria, and New Zealand and Australia. If this were true, and there is every possibility that Dr. Forbes' theory is sound, we can understand the present isolation of the Struthious Birds, which in ages past possessed a land-passage to South America and the other countries mentioned above. Thus the presence of Moas in Madagascar and New Zealand could be easily explained, and the likeness in structure between the Passerine Birds of the Australian and Neotropical Regions be accounted for. Confirmation of the theory of a former land-connection between these distant parts of the earth is to hand in the presence of Marsupials in the Australian and Neotropical Regions, but a still more wonderful proof of the former connection between the different faunæ of the southern parts of the globe, is afforded by the presence of identical genera of *fresh-water* fishes in New Zealand and South America.

Instances of co-relationship between the animals of these different Zoological Regions could be multiplied, did space but permit, but I trust that I have said enough to impress the mind of the earnest student with the immense amount of work which lies before the Ornithologist of the present day. My lectures were designed with the object of teaching this fact, and within this present publication I have tried to bring before my readers some of the most interesting of the phenomena of bird-life, and I hope that a few of them may be induced to take up the serious study of the subject. I will conclude with one word of warning. The study of Ornithology is a delightful pastime, but in the year 1898 it is not child's play!

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